ENGINEERING NEWS

Tribune Building, New York City.

GEO. H. FROST, PROPRIETOR.

SATURDAY, JUNE 25, 1881.

MR. GEORGE E. WARING has been assured by M. Alphand, states the *Genie Civil*, that his system of sewerage will be tried on a large scale before the end of the year. Mr. Waring has inspected the sewerage of the principal European cities.

AND this sewerage question has become a most important one in Paris. Two reports have been sent in by the examining committee to the Paris prefecture. There is one lesson to be drawn from these reports—that a more abundant circulation of water and a constant cleaning out of the sewers is requisite. But the largest sewers in Paris—those in the Avenue de l'Opera, etc—are so surrounded by water-pipes, pneumatic clock pipes, and telephone and telegraph cables, that it has become exceedingly difficult to clean them. The study of the different disinfecting agents is very complete, although it may not be encouraging to be informed that the *microbes* or germs are not destroyed by any agents except by antiseptics, properly so-called.

THE most prominent feature of the trip from Toronto to Montreal by water is the sublime indifference of the Canadian steamboat people to the comfort and convenience of their patrons. The Richelieu and Ontario Navigation Company is the name of the corporation which now has almost undisputed possession of the passenger business of the water route from Hamilton to Quebec, and thence up the Saguenay River. Twenty years ago the steamboat service from Detroit and Buffalo to Montreal on the American side was unexcelled by that of any inland waters on the continent. The steamboats were large, fast, and finely appointed in every respect, and the patronage was very great, a large portion of it being from the South during the hot months of the year. In 1861 all this was changed, and the entire fleet of American steamers, after being laid up at Ogdensburg for months, was sold to the United States Government for service on other waters. In 1863 only the small propellors of the Northern Transportation Line, from Ogdensburg to Chicago, were carrying passengers on the American side, and about four years ago even these were withdrawn, leaving the carrying trade of one of the most popular tourist's routes entirely in the possession of the Canadians. The steamboats now plying between Hamilton and Montreal are about thirty years old, and were built apparently to accommodate only the "overflow" traffic from the more popular and better appointed American lines. "Cheap and nasty" is written over them from stem to stern, from coal bunker to pennant, and the management (on the Corinthian at least) is as stolid and indifferent to the comfort of its patrons as the greasiest aborigine could be. What the hulls of these boats are after thirty years' buffeting among the breakers of the St. Lawrence River and Lake Ontario we can only conjecture; what is the condition of the boilers and machinery under the economical administration that provides for the sanitary needs of two hundred passengers a space sufficient only for the accommodation of two persons at the same time, and that will not supply even a passably decent supply of water, towels and soap at that; that will deal out the poorly cooked, poorly served "bull beef" rations that are employed (on the Corinthian at least) to demoralize the stomachs of average-fed travelers, time and a coroner's jury will have to establish; what the fate of the passengers in case of accident would be, one can easily determine for oneself after seeing the hog-like indifference of captain and crew to any but their own comfort. Why American enterprise cannot find a field for profit on the St. Lawrence River, is a problem which we leave to the men in the carrying trade to solve. There certainly seems to be a want in that direction which is now far from being supplied.

THE MONTREAL CONVENTION.

NIAGARA FALLS.

About ninety members and invited guests of the American Society of Civil Engineers met at the Cataract House, Niagara Falls, according to programme, on the morning of the 11th. Thanks to the previously made arrangements of Secretary Bogart and the local committee, but little time was lost at the hotel, and the entire party in carriages were soon at the International Suspension Bridge, which, under the intelligent guidance of L. L. Buck, Engineer of the recent reinforcement of the anchorages, was minutely inspected by those interested, while the sublime scenery of cataract, gorge and rapids was viewed by all with feelings such as each individual only could understand. Nearly two hours were pleasantly spent at this point, when a visit was made to the whirlpool on the Canadian side, after which the party returned to the hotel to lunch, and a drive over the Upper suspension bridge and thence on the Canadian side to Cedar Island and the burning spring. After dinner it was go-as-you-please, driving or walking on Goat Island, chatting on the verandah, visiting the curosity shops that supply the chief local trade of the place, viewing the colored jets d'eau in Prospect Park, and the colored illumination of the falls, and later on a total eclipse of the moon, arranged specially for this occasion, and which terminated the proceedings of the first day at Niagara. Sunday was spent according to the inclinations of each individual, which seemed mostly in favor of Goat Island, with its many attractions of shaded walks, quiet nooks, looking out upon the mighty cataract or the rushing rapids above, or rocky points tempting to adventure upon. The usual stock of bridal parties were also on hand, and it was interesting to watch the careful engineering of these graduates as they traversed Goat Island in search of secluded nooks only to find them universally pre-empted. The weather during both days was unexceptionally fine; the local arrangements, under the efficient and painstaking care of Mr. Benjamin Rhodes and Mr. L. L. Buck, were perfect, and prevented any question of possible extortion; the hotel was not crowded, and the time was very happily and profitably passed.

LIST OF NAMES REGISTERED AT NIAGARA FALLS, JUNE 12, 1881.

Asbbel Welch, Vice-President; Miss Welch, Lambertville, N. J.; Miss E. S. Welch, Frankfort, Ky.; E. A. Doane, Chief Engineer Rome, Watertown & Ogdensburg Railroad; Mrs. Doane, Oswego, N. Y.; C. D. Ward, Jersey City; S. Haslett, Brooklyn, N. Y.; J. G. Van Horne, Jersey City; Miss Van Horne, M. Coryell and Mrs. Coryell, Lambertville, N. J.; D. Mc N. Stauffer, Engineer Dorchester Tunnel, Boston Imp. Sewerage; Col. A. F. Wrotnowski, Chief Engineer Louisiana Levee Commission, New Orleans; F. Slataper, Chief Engineer Pennsylvania Company; Mrs. Slataper and Miss Slataper; Mrs. E. Gross, Pittsburgh, Pa.; Wm. P. Harris, Superintendent New York & Greenwood Lake Railroad; Mrs. Harris; Miss Florence Harris; Mrs. E. H. Potter, Newark, N. J.; C. Constable, Constableville, N. H.; A. Bonzano, Chief Engineer Phœnixville Bridge Works; Mrs. Bonzano; Master Bonzano; Charles Latimer, Chief Engineer New York, Lake Erie & Pennsylvania Railroad, Cleveland, O.; William H. Lotz, M. E., Chicago, Ill.; William H. Wiley, publisher, New York; Mrs. Wiley and Miss Sarah Wiley; S. E. Tinkham, Secretary Boston Society Civil Engineers; William E. Worthen and Mrs. Worthen, New York; R. E. McMath, St. Louis, Mo.; John W. Weston, *American Engineer*, Chicago, Ill.; B. D. Hasell, New York; Thomas D. Lovett, Cincinnati, O.; B. Godwin, New York City; Prof. A. J. Du Bois, C. E. Sheffield, Scientific School, New Haven; R. O. DuBois, Miss DuBois; H. M. Wightman, City Engineer, Boston; Joseph P. Davis, Vice-President Metropolitan Telephone Company, N. Y.; J. W. Bacon, Railroad Commissioner, Mrs. Bacon, Miss Bacon and Master Bacon, Danbury, Conn.; John Bogart, Secretary American Society Civil Engineers; Mrs. Bogart, New York City; Miss Macdonald, New York City; Jas. B. Francis, President American Society Civil Engineers, Mrs. Francis, Lowell, Mass; E. L. Corthell, late Chief Engineer Mississippi Jetties, New York City; Henry Manley, Boston, Mass.; D. Bontecou, New York City; A. J. Menocal, Chief Engineer Government Nicaragua, Washington, D. C.; Thomas B. Lee, Assistant Secretary American Society Civil Engineers; Amory Coffin, Chief Engineer Phœnix Iron Company, Mrs. Coffin, Phœnixville, Pa.; C. C. Martin, First Assistant Engineer East River Bridge, Mrs. Martin, the Misses Martin, Brooklyn; R. L. Read, Mrs. Read, Cincinnati, O.; H. G. Prout, New York City; S. F. Lewis, New Orleans, La.; S. S. Haight, New York City; A. B. Hill, Assistant City Engineer, New Haven, Conn.; Miss Sandford, New Haven; C. A. Ferry, Assistant City Engineer, New Haven; Mrs. Ferry; G. H. Frost, ENGINEERING NEWS, New York City; Mrs. Frost; J. G. Bodemer, Saxony; Jörgen Dahll, Christiana, Norway; Professor Egleston, Columbia College, New York City; Geo. H. Simpson, City Engineer, Terre Haute, Indiana; R. Hering, Assistant City Engineer, Philadelphia; Mrs. Hering and Miss Gregory; Mr. Carl Hering; John MacLeod, Louisville, Ky.; Mrs. MacLeod; A. P. Boller, Chief Engineer Metropolitan Elevated Railroad, New York City; Charles H. Fisher, Chief Engineer N. Y. C. & H. R. R., Albany, N. Y.; H. G. Morris, Mrs. Morris, Master Morris, Miss Morris, Philadelphia; Mansfield Merriman, Prof. C. E. Lehigh University, Bethlehem, Pa.; C. L. Crandall, Ithaca, N. Y.; C. L. Doolittle, Bethlehem, Pa.; E. D. Meier, Mrs. Meier and family, St. Louis, Mo.

AT TORONTO.

The excursionists arrived at Toronto at 10 a. m. Monday. They were met at the Yonge street station of the Great Western Railway by Mr. Wm. Gooderham, who had provided carriages for a drive about the city. A visit was made to the station of the Toronto & Nipissing Railway to see the operation of the Haggas water elevator, for supplying locomotive tanks with water. This machine is a steam injector without any particular claim to novelty except as to convenience for the purposes intended. An engine and tender was stationed on the dock; at the word given, the fireman of the engine took from its box a length of hose by which he connected the "elevator" and a hydrant; in a trifle less than five minutes from the start the tender was filled to overflowing. The "elevator" was pronounced a success, and several were ordered for use on American railways. Pamphlets and circulars illustrative of the device were distributed, and can be had of Mr. Gooderham, Jr., Toronto.

The drive about the city was continued till 12:30 p. m., when it terminated at the residence of Colonel Gzowski, A. D. C. to the Queen, and himself a member A. S. C. E. The following is the report of the reception taken from the Toronto *Mail*, the editor of which was also present:

Hearing that the delegates intended to proceed to Montreal by way of Toronto, Colonel Gzowski, A. D. C. to her Majesty, himself a member of the American Society of Civil Engineers, and also of the Institution of Civil Engineers of Great Britain, and a Fellow of the Royal Geographical Society, wrote last week to the Secretary, Mr. John Bogart, at New York, saying that he would be pleased to receive the delegates at his residence upon their arrival in this city. He did not receive an answer to his letter until late on Saturday night, and therefore his reception to the delegates and their ladies yesterday was in a measure *impromptu*. The beautiful residence, which is filled with valuable works of art in painting, statuary and *bric-a-brac*, was thrown open for the visitors. Shortly before noon his Honor, the Lieutenant-Governor, attended by Capt. Geddes, A. D. C., arrived, and was shown to the drawing-room, where were the Colonel and Mrs. Gzowski, Mr. C. S. Gzowski, Jr., Mrs. C. S. Gzowski, Jr., Dr. Daniel Wilson, President of the University, and Mr. C. W. Bunting, M. P. Shortly after noon the visitors were announced, and were received by Colonel and Mrs. Gzowski, in the drawing-room. His Honor the Lieutenant Governor and Mrs. Gzowski, Jr., assisted at the reception. The first-mentioned lady wore a becoming costume of French gray satin and a morning cap of old lace, while Mrs. Gzowski, Jr., appeared in a tasteful toilet of ecru silk. The gentlemen and lady visitors, whose names are published elsewhere, were duly announced.

After the reception the visitors were conducted to the picture gallery. In the collection are two originals of Joshua Reynolds, some very fine landscapes, and many figure subjects from the old masters, comprising a very valuable collection. Upon the tables was an extensive array of works upon zoology and ornithology, with beautiful illustrations colored by hand. One of the most interesting books of the collection is a large volume giving a history of the construction of the Victoria bridge. It was prepared specially by the Brasseys for presentation to notable people, being inscribed to Prince Albert. A single copy of the work cost £250 sterling. The letter press of the volume is perfect, and each page has a gilt border. The engravings of the work, and the diagrams drawn to scale, make it a most interesting volume for engi-

neers. After viewing the beauties of this apartment, the visitors proceeded through the conservatory to the lawn, where, under the wide-spreading branches of the trees, refreshments were served. The band of the Queen's Own rifles, under the leadership of Mr. Bailey, was stationed near the entrance to the conservatory, and during the stay of the visitors performed several selections charmingly. Appetite having been satisfied, Col. Gzowski called upon those present to drink to the prosperity of the American Society of Civil Engineers. In proposing the toast, he spoke of the satisfaction which the visit of the delegates had given Mrs. Gzowski and himself, and the only sorrow he had was that their stay would be so short. He regretted that in their journey through the province they had not been able to inspect one of the greatest engineering works in the history of Canada—the Welland Canal. He expressed pleasure at the society's choice of Montreal as a place of meeting, for while there they would have an opportunity of inspecting the Victoria bridge, which was a great triumph of engineering skill. He proposed the health of the American Society of Civil Engineers, coupled with the name of Mr. Francis.

The band—"Yankee Doodle."

Mr. Francis returned thanks for the compliment. He had a health to propose—the health of a lady who was dear to them all, a lady who has for her favorite motto "A man's a man for a' that"—the health of her Majesty, Queen Victoria. (Cheers.)

The band—"God Save the Queen."

Col. Gzowski said, speaking as an aide-de-camp of her Majesty, that no person is permitted to return thanks for the toast of her Majesty's health; but he was sure that if our gracious Queen were present she would smile upon them all. (Cheers.)

Dr. Wilson hoped that it was not the last visit the American civil engineers would pay to the city, and when they came again he would be glad to welcome them to the University, and show them through the department of philosophy and science, which they would find interesting.

Mr. Welch informed the gathering that he had discovered that Col. Gzowski, who is a Canadian now, was an American in his younger days, and commenced the study of engineering with Col. Wm. Milnor Roberts in Pennsylvania. (Cheers).

Mr. Bogart, in proposing the health of the Lieut.-Governor, said that from what they had seen of Canada they could appreciate the wonderful progress the country had made.

The toast having been honored, his Honor said that it should be a pleasure for every Canadian to see his friend Col. Gzowski extending his hospitality to his American professional friends. It pleased him to see his friend welcome the engineers, and make a small return for the hospitalities which Americans in their own land are so lavish of. Referring to the successful career of Col. Gzowski, his Honor attributed that success to the fact that he had married an American lady. (Cheers.)

Mr. William E. Worthen proposed the health of Mrs. Gzowski, Sr., Mrs. Gzowski, Jr., and the children and grandchildren, the toast being received with enthusiasm.

Col. Gzowski, in returning thanks, said that he had married the lady whose health they had just drank, in Pennsylvania, forty-two years ago, when he was a draughtsman in Col. Milnor Robert's office, making the plans of the Erie Canal. She was proud of her country and he was proud of her. (Cheers.)

The delegation wishing to depart for Montreal on steamer at two o'clock, then took leave of their entertainer, and re-entering the cabs were driven to the boat landing. A great many friends gathered at the boat landing to wish them good-bye. Regrets at being compelled to leave the city so soon were heard upon all sides, while the reception at Col. Gzowski's was spoken of as a gathering which would be food for pleasant recollection.

At 2.30 p. m. the party embarked aboard the steamer Corinthian, of the Ontario and Richelieu Navigation Line, plying between Hamilton and Montreal. Arrangements had previously been made for a special boat, but at the last the steamboat people decided to take the whole party on the regular boat, and assured them by telegraph that state-rooms sufficient in number had been assigned. On arriving at the boat, however, it was discovered that state-rooms for about one-half the party only had been kept, so that there was no alternative but to accept the situation and take the cabin floor for the night. At 6 a. m. the boat arrived at Kingston, and the opportunity was improved to go out foraging for something to eat. One hotel was found where some bread and coffee was obtainable in quantity sufficient to allay hunger until breakfast was ready. The trip down the St. Lawrence was very delightful, and a very small outlay by the steamboat company for an awning over the small foredeck would add greatly to the pleasure. As it was the deck was scorching hot, and obliged a good many to remain inside the cabin for a portion of the day. Aside from the poor food served, the niggardly arrangements for the toilet, the want of protection from the burning sun, and the absolutely brutal indifference of the officers to the comfort of the passengers, the trip down the magnificent river merits all the praise that has been awarded it and will well repay the time and cost to make it. A new steamboat line is about to be put in between Lewiston and Montreal, and it is to be hoped that it will be made so profitable that it will be maintained. Opposition is greatly needed in the interest of the traveling public. The present line is not creditable to Canadian enterprise, and it was with a great deal of satisfaction that our excursionists, after the mild excitement of "running the rapids," arrived in Montreal at 8 p. m., and received the cordial reception that awaited them at the landing. Carriages in waiting soon conveyed the party to the fine Windsor Hotel, where, hunger being allayed, the tired excursionists soon sought the rest which they so much needed.

MONTREAL.

The Thirteenth Annual Convention of the American Society of Civil Engineers was opened at 10 a. m., June 15, in Molson Hall, McGill University, Montreal, Canada. The following gentlemen occupied seats on the platform with the President, Vice-President and Secretary of the Society: Hon. J. L. Beaudry (M. L. C.), Mayor of Montreal; Principal Dawson, C. M. G., McGill University; F. W. Henshaw, President of the Board of Trade; Robt. Mitchell, President of the Corn Exchange; Thos. White, M. P.; J. Q. Smith, American Consul; Hon. J. J. C. Abbott, Archdeacon Leach, Rev. Canon Baldwin, Dr. Scott, Thos. C. Keefer, Sandford Fleming, C. B.; Jno. Kennedy, Harbor Engineer; Geo. D. Ansley, City Surveyor; Andrew Robertson and several others.

The convention was called to order by the Secretary, after which Mr. Thomas C. Keefer was elected Chairman.

Mayor Beaudry, who, though suffering from severe illness, had honored the occasion with his presence, was introduced by the Chairman. He regretted that he was unable to read an address expressive of the sentiments which he entertained in regard to the visit of the Convention to Montreal, yet congratulated them on their presence in the city to which he welcomed them, at the same time extending to them its freedom.

The Mayor's address was then read by his son-in-law, Mr. Roy, City Attorney, as follows:

Mr. President and Members of the American Society of Civil Engineers:

I have the honor, in the name of our citizens, to welcome you and to offer you the freedom of this our city of Montreal. I believe it is the custom of your Society to hold a Convention annually in some of the principal cities of the continent, and this is, I believe, your thirteenth, and the first one held outside of the limits of United States territory. I was about to say, your own country, as was recently remarked by one of our city newspapers, in commenting upon your expected visit: but I will not make use of that phrase myself, because I think that, as engineers, men who are intimately identified with all the great enterprises which unite not only territories but continents in the great march of civilization and progress, it should not be said that you are not in your own country, merely because you have crossed the line which divides two distinct political governments. I am sure that the American engineer never feels out of his country in pursuing the objects of his noble profession; at all events he need not feel so while he is in this Canada of ours; the lines that mark differences in political institutions are obliterated in these pursuits; besides, are not the arms of your Society extended open to your professional brethren on this side of the line, and we note, as citizens in Canada and in this city, men who are members of your honorable body, and to whom the privileges and honors of your institution are extended as fully and as freely as to those who live under the American flag? Your brethren here, I am very certain, do not look upon you as strangers out of your own country, but they are, as you are yourselves, all members of one body that knows no difference in creed or nationality; and the Montreal members must feel gratified in being the cause, as I have no doubt they are, of the honor of this distinguished visit to our city.

In connection with this visit, my attention has been particularly drawn to the importance of your Society as an institution, and I have to offer you my humble congratulations on the aims and objects for which it exists. I have glanced over the subjects which claim your thought and study, and the manner in which, in your discussions, those subjects are treated shows me how you probe and burrow for the truths of practical life, and prompts me to increase, if that were possible, my admiration for the noble profession of civil engineering; that profession whose object, it has been truthfully said, is the improvement of everything it touches for the use, economy and convenience of man. It is to your profession, Mr. President and gentlemen, that we are indebted for the great highways of commerce that stretch far and wide over the continent, from the Atlantic to the Pacific, that has shortened the once almost trackless ocean between two great commercial worlds to a mere bagatelle of a trip, that brings those magnificent ships to our harbors, that has laid hold of the lightning and used it to link the whole civilized world in instantaneous communication, that pierces our mountains to let the iron horse go through, that bridges our rivers, so that even our great St. Lawrence offers no obstacle to the transportation of our merchandise and our products at all seasons of the year. And I am aware that, in the intelligent assemblage which I have now the privilege of addressing, there are men who have "done these things" and capable of doing, and will do, still greater than have yet been done; minds which have conceived and carried to successful completion many of those bold projects in the interest of commerce which have astonished the world, and won the admiration and gratitude of their fellow-citizens and brought down honor to their country. It is to your profession also that we are indebted for many of the conveniences, comforts and even luxuries of daily life; usefulness to your fellow-men is your great aim. And many of you have placed your names high up on the rolls of fame, both in this and the mother country, for your achievements in your art. It is, therefore, an honor to our city that you have, by an almost unanimous vote, selected her as the place for this meeting.

With regard to what we have to offer for your entertainment, I regret that we have not much to show of that which is most interesting to you. The Victoria Bridge and the workshops of the Grand Trunk Railway Company are worthy of your inspection; the harbor may also present a feature of interest to you; and, on behalf of the city works, there are the water-works and the Mount Royal Park.

In conclusion, Mr. President and gentlemen, let me say that, although our city lies far north, the hearts of our people are warm, and, on behalf of the citizens, accept my best wishes for your enjoyment here and for the success of your meeting, and I hope that this will not be your last convention here; I also hope on behalf of our Canadian engineers who are not members, that they will take advantage of the privileges your institution offers them, and that the Canadian membership will augment, for we cannot shut our eyes to the fact that union of men, particularly in such noble pursuits as those of your calling, must tend largely to cement the friendly feeling which exists between both sides of the line which separates our governments.

Again, Mr. President and gentlemen, let me heartily welcome you, and tender you the freedom of the city.

Mr. F. W. Henshaw, as President of the Board of Trade, indorsed the words of welcome spoken by the Mayor. In his opinion the profession and practice of engineering were most closely identified with the whole commercial interests of the country, and he felt very much pleased at the presence of so many eminent representatives of such a noble profession.

Mr. Thomas White, M. P., another member of the Council of the Board of Trade, expressed the pleasure he took in meeting the members of the Society. To them and to their professional brothers we owed our railways, our canals, our great water highways, and consequently our commerce, and in a large measure our very civilization.

Mr. Mitchell, President of the Corn Exchange, spoke briefly in endorsement of the views expressed by the other members.

The Chairman then introduced Dr. Dawson, referring to him as a gentleman of a trans-Atlantic as well as cis-Atlantic reputation.

Principal Dawson said: "It gives me much pleasure to welcome to Montreal and to this university the distinguished body which now honors us with its presence. Since 1857 this university has recognized civil engineering as one of the

learned professions by the appointment of a professor of that subject and the institution of a course of studies thereon. It was the first university in this Dominion to institute such a course, and for more than twenty years the graduates have been going forth to occupy positions of usefulness on the public works and engineering enterprises of the country. That our position in this respect has been a wise one is proved by the growth of our engineering department, now united with the other professions of mechanical and mining engineering in our faculty of applied science, and by the public support which the effort has secured. The work of the engineer, based on scientific principles, and carrying out, in accordance with these great enterprises of construction, almost of creation, is undoubtedly one of the highest connected with the material advancement of nations. The engineer is, in truth, at once the missionary and pioneer of material civilization in its extension into new fields, and the organizer of the means whereby the larger and denser communities of men can exist with comfort, can be supplied with the necessaries and luxuries of life, and can hold communication with each other. Without the structures which he plans, rears and maintains, the fabric of our modern civilization would fall asunder, and its political, commercial and social arrangements would disappear like a dream. We do well, therefore, to welcome you as representatives of this great and honorable profession, and of the science and culture which its achievements represent, and to throw open to you whatever we have in books, collections, or other objects of interest. Not being an engineer, I cannot refer to those works in which you are professionally interested, but as a geologist I may introduce you to the ancient and venerable formations on which our city stands. The Lower Silurian limestone of Trenton age which underlies a great part of the Island of Montreal, a congeries of organic fragments has, nevertheless, attained to the hardness and density of a marble, and is a chief material of construction along with its companion beds, the Chazy and Black River limestones. These may be well seen in the extensive quarries near the city. The next formation in ascending order, the thick and soft Utica shale, has permitted our noble river to excavate its bed along its outcrop and furnishes a kindly rock in which to construct the great tunnel which is some time to cross our river and to relieve the Victoria Bridge. Breaking through the Trenton limestones we have the grand mass of igneous rock of Dioritic and Syenitic character, which forms Mount Royal, on which our Mountain Park is laid out, and which serves also the more homely use of supplying material to macadamize our streets. Dr. Hunt and Dr. Harrington have worked out much of the chemical and microscopic characters of this great and varied mass. Associated with the mountain in origin is the patch of volcanic breccia on St. Helen's Island, a remnant of the ancient cone of the Montreal volcano, and which by the fossils of Upper Silurian age associated with it fixes the age of the chief eruptions of our mountain. Lastly, in the much later Ledea clays and Saxicava sands of Pleistocene age, overlying the older formations, we have the material of our bricks; and in them the geologist can collect abundant specimens of marine shells, identical in species with those now living in the northern part of the Gulf of St. Lawrence, and indicating the submergence of our country under the cold waters of the Arctic Sea in that age known as the Glacial period, and in which the imagination of certain extreme theorists would have us believe that our continent was covered with a mantle of solid ice. The Montreal that now is profits by all these preparations of past geological ages, and, having passed out of its Glacial age, can welcome you to a summer clime, a rich vegetation and the hospitality of a growing, if not yet a great, city.

Vice-President Welch responded as follows on behalf of the Convention: Mr. President, your worthy Mayor used one expression which runs against all my former ideas. He spoke of the American Society of Engineers being out of our own country. Why, I thought Canada was in America. (Applause.) It does not make any difference whether one part of the people resident on this continent acknowledge as their chief magistrate the gentleman that lives in the White House, or the other as chief magistrate that glorious woman we all love, not because she is Queen of Great Britain and Ireland and Canada, not because she is Empress of India, not because she is chief magistrate of one-quarter of the human race, and that the best quarter (laughter and applause) but because she is a woman that follows the sentiment, "The rank is but the guinea stamp," and the men and women are the gold. It does not matter whom we acknowledge as our chief magistrate. We are all Americans, and I in the simplicity of my heart thought that the American Society of Civil Engineers included Canada. I thank you sincerely for the cordial welcome which has been accorded to us. Mr. President, this welcome, and one or two welcomes in Canada that I have witnessed, remind me of a great contrast. In 1812 some Americans came over to Toronto—then known as Little York—and were welcomed on that occasion with bayonets and bullets and grape shot. But there has been a big change since then, for yesterday other Americans came over and were received with warm welcomes and friendly greetings. We have heard of great physical benefits that the societies of civil engineers have conferred upon mankind, but that is not the highest object attained by civil engineers. The civil engineer has made bonds between the North and South of the United States. These bonds have healed disunions and mitigated hostility that unfortunately existed at one time, and I believe that the railroads of the North and South have done more than any other cause except religion to harmonize those countries; so it is with other countries. Canada and the United States are one people, though under different governments. That engineer has a very inadequate idea of his mission who considers that physical good—commercial good—is the highest end of his profession. The real and highest aim of the engineer, by the works he constructs and by the union of the whole world into one by the construction of railroads, canals and telegraph lines, is to civilize and Christianize mankind. (Applause.)

The Secretary then announced the titles of the several papers which were to be read before the Convention. Among others were: Comparative Economy of Light and Heavy Rails, by A. Welch; Wrought Iron Columns, by T. C. Clarke; Repairs of Masonry, by O. Chanute; Weights and Measures, by E. Latimer; Strength and Durability of the Copper-Tin-Zinc Alloys, R. H. Thurston; Standard Time for Railroads and Telegraphs in America, by Sandford Fleming; Montreal Harbor Improvements, by G. D. Ansley, for James Shearer; Sewerage Systems, by R. Hering; Report of Committee on Cement Tests, by J. D. Whittemore; Improved Level, by Perez Vanttruhle; Water Elevator, by Wragge Chanute.

The Secretary, Mr. J. Bogart, then read an exhaustive paper on "The Reinforcement of the Anchorages and Renewal of the Suspended Superstructure in Iron of the International Railway Suspension Bridge at Niagara Falls," by Mr. L. L. Buck.

At the conclusion of the reading of the paper, the President announced that Messrs. Dawson & Bros. had kindly furnished maps of Montreal and its vicinity for the benefit of those who were to drive around the city and Mountain Park in the afternoon.

It was also announced that the Department of the Interior had sent down 100 maps of the Northwest Territory for the use of the Society.

A short but most important paper was then read by Mr. Sandford Fleming on "Standard Time for Railroads and Telegraphs in America." It dwelt on the great importance of having a system of standard time on the railroads of North America, and Mr. Fleming suggested that a Committee be appointed to make inquiries and to report at a future meeting. After a short discussion on the suggestion, it was resolved to leave the appointment of the committee until after the discussion on the paper in the evening.

The meeting then adjourned.

The afternoon, from 2 to 4.30 o'clock was spent in driving through the city, and Mount Royal Park, the party arriving at the latter hour at Terrace Bank, the residence of Mrs. Redpath, who had opened her house and grounds for the enterment of visitors to a garden party, at which also a considerable number of Montreal people were present. The time to 6 o'clock was most delightfully spent in conversation, in witnessing a game of lawn tennis, in climbing the adjacent mountain side, wandering through the beautiful grounds, and in partaking of the bountiful collation spread for the guests. Mrs. Redpath was assisted in entertaining the visitors by her son Mr. Frank Redpath and Mrs. Redpath, and by her son-in-law, Prof. Bovey, of McGill University, M. Inst. C. E., and Mrs Bovey.

THE EVENING SESSION.

The evening session was opened at 8.30 o'clock with the reading of a letter from Mr. Joseph Hickson, General Manager of the G. T. R., placing a special train at the disposal of the Convention on Saturday, if they desired to visit Quebec, and regretting his inability to attend the meetings of the Convention.

The Chairman announced that the Art Gallery of the Montreal Art Association and the Museum of McGill University were open to delegates.

A telegraphic message was read from Mr. Collingwood Schrieber, Engineer of Government Railways placing a special train on the Intercolonial Railway at the disposal of the Convention if they desired to visit the maritime provinces.

The Dixon Crucible Company, believing engineers to be the best judges of black lead on the continent, forwarded a number of their own manufacture for distribution among the delegates.

A telegram was received from Mr. Benjamin Rhodes, of Niagara Falls, inviting the society to hold its next annual convention at that place.

THE PRESIDENT'S ANNUAL ADDRESS.

The President then read his annual address, as follows:

You have assembled in convention for the first time outside the limits of the United States, and I congratulate you on the selection of this beautiful city, in which and its immediate neighborhood there are so many interesting engineering works constructed with the skill and solidity characteristic of the British school of engineering. Nine of our members are Canadian engineers, which must be the excuse of the other members for invading foreign territory. The society was organized November 3, 1852, and actively maintained up to March 2, 1855. Eleven only of the present members date from this period. October 2, 1867, the society was reorganized on a wider basis, and from that time to the present it has been constantly increasing in interest and usefulness. The membership of the society is now as follows :

Honorary members	11
Corresponding members	3
Members	491
Associates	21
Juniors	57
Fellows	53
Total	636

During the last year we have lost six members by death and five by resignation, and 56 new members have been elected and qualified. The most interesting event to the Society since the last Convention has been the purchase of a house in the city of New York, as a permanent home, at a cost of $30,000. This has been accomplished, so far, without taxing the resources of the Society, the required payments having been met by subscription. The sum of $11,900 had been subscribed to the building fund up to the 27th ult. by 70 members and 29 friends of the Society who are not members. The subscription is still open, and it is expected that large additions will be made to it by members and their friends to enable the Society to make the remaining payments without embarrassment. Meetings of the Society are held twice in each month during ten months in the year, for the reading and discussion of papers and other purposes; the new house affords much better accommodations for these purposes than we have ever had before, and also for the library, which now contains 8,850 books and pamphlets, and is constantly increasing. A catalogue of the library is being prepared. Part 1, embracing railroads and the transaction of scientific societies, has been printed and furnished to members.

WATER POWER.

Water power in many of the States is abundant, and contributes largely to their prosperity. Its proper development calls for the services of the civil engineer, and as it is the branch of the profession with which I am most familiar, I propose to offer a few remarks on the subject: The earliest applications were to grist and saw mills; carding and fulling mills soon followed; these were essential to the comfort of the early settlers, who relied on home industries for shelter, food and clothing; but with the progress of the country came other requirements. The earliest application of water power to general manufacturing purposes appears to have been at Paterson, N. J., where "The Society for Establishing Useful Manufactures," was formed in the year 1791. The Passaic River, at this point, furnishes, when at a minimum, about 1,100 hor e-power, continuously night and day. The water power of Lowell, Mass., was begun to be improved for general manufacturing purposes in 1822. The Merrimack River at this point has a fall of 35 ft., and furnishes, at a minimum, about 10,000 horsepower during the usual working hours. At Cohoes, in the State of New York, the Mohawk River has a fall of about 105 ft., which was brought into use systematically very soon after

that at Lowell, and could furnish about 14,000 horse-power during the usual working hours, but the works are so arranged that part of the power is not available at present. At Manchester, N. H., the present works were commenced in 1835. The Merrimack River at this point has a fall of about 52 ft., and furnishes, at a minimum, about 10,000 horse-power during the usual working hours. At Lawrence, Mass., the Essex Company built a dam across the Merrimack River, commencing in 1845, and making a fall of about 28 ft., and a minimum power, during the usual working hours, of about 10,000 horse-power. At Holyoke, Mass., the Hadley Falls Company commenced their works about 1845 for developing the power of the Connecticut River at that point, where there is a fall of about 50 ft. at a minimum about 17,000 horse-power during the usual working hours. At Lewiston, Me., the fall in the Androscoggin River is about 50 ft; its systematic development was commenced about 1845, and with the improvement of the large natural reservoirs at the head waters of the river now in progress, it is expected that a minimum power, during the usual working hours, of 11,000 horse-power will be obtained. At Birmingham, Connecticut, the Housatonic Water Company have developed the water power of the Housatonic River by a dam giving 22 ft. fall, furnishing at a minimum about 1,000 horse-power, during the usual working hours. The Dundee Water and Land Company about 1858 developed the power of the Passaic River at Passaic, New Jersey, where there is a fall of about 22 ft., giving a minimum power, during the usual working hours, of about 900 horse-power. The Turner's Falls Company, in 1866, commenced the development of the power of the Connecticut River at Turner's Falls, which is about 35 ft., and furnishes a minimum power, during the working hours, of about 10,000 horse power. I have named the above water powers as being developed in a systematic manner from their inception, and of which I have been able to obtain some data. In the usual process of developing a large water power, a company is formed who acquire the title to the property, embracing the land necessary for the site of a town to accommodate the population which is sure to gather around an improved water power. The dam and canals or races are constructed, and mill sites, with accompanying rights to the use of the water, are granted, usually by perpetual leases subject to annual rents. This method of developing water power is distinctly an American idea, and the only instance where it has been attempted abroad, that I know of, is at Bellegarde, in France, where there is a fall in the Rhone of about 33 ft. Within the last few years, works have been constructed for its development, furnishing a large amount of power, but from the great outlay incurred in acquiring the titles to the property, and other difficulties, it had not been a financial success. The water powers I have named are but a small fraction of the whole amount existing in the United States and the adjoining Dominion of Canada. There is Niagara with its two or three millions of horse-power; the St. Lawrence with its succession of falls from Lake Ontario to Montreal; the falls of St. Antony, at Minneapolis, and many other falls, with large volumes of water, on the Upper Mississippi and its branches. It would be a long story to name even the large water powers, and the smaller ones are almost innumerable. In the state of Maine a survey of the water power has recently been made, the result, as stated in the official report, being "between one and two millions of horse-powers," part of which will probably not be available. There is an elevated region in the northern part of the South Atlantic States, exceeding in area 100,000 square miles, in which there is a vast amount of water power, and being near the cotton fields, with a fine climate, free from malaria, its only needs are railways, capital and population to become a great manufacturing section. The design and construction of the works for developing a large water power, together with the necessary arrangements for utilizing it and providing for its sub-division among the parties entitled to it, according to their respective rights, affords an extensive field for civil engineers, and, in view of the vast amount of it yet undeveloped, but which, with the increase of population and the constantly increasing demand for mechanical power, as a substitute for hand-labor, must come into use, the field must continue to enlarge for a long time to come. There are many cases in which the power of a waterfall can be made available by means of compressed air, more conveniently than by the ordinary motors. The fall may be too small to be utilized by the ordinary motors; the site where the power is wanted may be too distant from the waterfall, or it may be desired to distribute the power in small amounts at distant points. A method of compressing air by means of a fall of water has been devised by Mr. Joseph E. Frizell, C. E., of St. Paul, Minnesota, which, from the extreme simplicity of the apparatus, promises to find useful application. The principle on which it operates is by carrying the air in small bubbles in a current of water down a vertical shaft to the depth giving the desired compression, then through a horizontal passage, in which the bubbles rise into a reservoir near the top of this passage, the water passing on and rising in another vertical or inclined passage at the top of which it is discharged, of course, at a lower level than it entered the first shaft. The formation at waterfalls is usually rock, which would enable the passages and the reservoir for collecting the compressed air to be formed by simple excavations, with no other apparatus than that required to charge the descending column of water with the bubbles of air, which can be done by throwing the water into violent commotion at its entrance, and a pipe and valve for the delivery of the air from the reservoir. The transfer of power by electricity is one of the problems now engaging the attention of electricians, and it is now done in Europe in a small way. Sir William Thompson stated in evidence before an English Parliamentary Committee, two years ago, that he looked "forward to the Falls of Niagara being extensively used for the production of light and mechanical power over a large area of North America," and that a copper wire, half-an-inch in diameter, would transmit twenty-one thousand horse-power from Niagara to Montreal, Boston, New York or Philadelphia. His statements appear to have been based on theoretical considerations, but there is no longer any doubt as to the possibility of transferring power in this manner; its practicability for industrial purposes must be determined by trial. Dr. Paget Higgs, a distinguished English electrician, is now experimenting upon it in the city of New York. Great improvements in reaction water-wheels have been made in the United States within the last 40 years. In the year 1843 the late Uriah Atherton Boyden, a civil engineer of Massachusetts, commenced the design and construction of Fourneyron turbines in which he introduced various improvements and a general perfection of form and workmanship which enabled a larger percentage of the theoretical power of the water to be utilized than had been previously obtained. The great results obtained by Boyden with water-wheels, made in his perfect manner, and, in some instances, almost regardless of cost, undoubtedly stimulated others to attempt to approximate to those results at less cost, and there are now many forms of wheel at low cost, giving fully double the power, with the same consumption of water, that was obtained from most of the other forms of wheels of the same class.

ANCHOR ICE.

A frequent inconvenience in the use of water power in cold climates is that peculiar form of ice called anchor or ground ice. It adheres to stones, gravel, wood and other substances forming the beds of streams, the channels of conduits and orifices through which water is drawn; sometimes raising the level of water-courses many feet by its accumulation on the bed, and entirely closing small orifices through which water is drawn for industrial purposes. I have been for many years in a position to observe its effects and the conditions under which it is formed. The essential conditions are, that the temperature of the water is at its freezing point, and that of the air below that point; the surface of the water must be exposed to the air and there must be a current in the water. The ice is formed in small needles on the surface which would remain there and form a sheet if the surface was not too much agitated, except for a current or movement in the body of water sufficient to maintain it in a constant state of intermixture. Even when flowing in a regular channel there is a continued interchange of position of the different parts of a stream, the retardation of the bed causes variations in the velocity, which produce whirls and eddies and a general instability in the movement of the water in different parts of the section, the result being that the water at the bottom soon finds its way to the surface, and the reverse. I found by experiments on straight canals, in earth and masonry, that colored water discharged at the bottom reached the surface at distances varying from 10 to 30 times the depth. In natural water courses, in which the beds are always more or less irregular, the disturbance would be much greater. The result is that the water at the surface of a running stream does not remain there, and when it leaves the surface it carries with it the needles of ice, the specific gravity of which differs but little from that of the water, which, combined with their small size, allows them to be carried by the current of water in any direction. The converse effect takes place in muddy streams. The mud is apparently held in suspension, but is only prevented from subsiding by the constant intermixture of the different parts of the stream; when the current cease the mud sinks to the bottom; the earthy particles composing it being heavier than water, would sink in still water in times inversely proportional to their size and specific gravity. This, I think, is a satisfactory explanation of the manner in which the ice formed at the surface find its way to the bottom. Its adherence to the bottom, I think, is explained by the phenomenon of regelation first observed by Faraday; he found that when the wetted surfaces of two pieces of ice were pressed together they froze together, and that this took place under water even when above the freezing point. Professor J. D. Forbes found that the same thing occurred by mere contact without pressure, and that ice would become attached to other substances in a similar manner. Regelation was observed by these philosophers in carefully arranged experiments with prepared surfaces, fitting together accurately, and kept in contact sufficiently long to allow the freezing together to take place. In nature these favorable conditions would seldom occur in the masses of ice commonly observed, but we must admit, on the evidence of the recorded experiments, that, under particular circumstances, pieces of ice will freeze together or adhere to other substances in situations where there can be no abstraction of heat. When a piece of ice of considerable size comes in contact under water with ice or other substance, it would usually touch in an area very small in proportion to its mass, and other forces acting upon it, and tending to move it, would usually exceed the freezing force, and regelation would not take place. In the minute needles formed at the surface of the water the tendency to adhere would be much the same as in larger masses touching at points only, while the external forces acting upon them would be extremely small in proportion, and regelation would often occur, and of the immense number of the needles of ice formed at the surface, enough would adhere to produce the effect which we observe and call anchor ice. The adherence of the ice to the bed of the stream or other objects is always down stream from the place where they are formed; in large streams it is frequently many miles below; a large part of them do not become fixed, but as they come in contact with each other regelate and form spongy masses, often of considerable size, which drift along with the current and are often troublesome impediments to the use of water power. Water powers supplied directly from ponds or rivers or canals frozen over for a long distance immediately above the places from which the water is drawn are not usually troubled with anchor ice, which, as I have stated, requires open water, up-stream, for its formation.

Mr. Fleming's paper on Standard Time was then discussed by Prof. Hilgard, of the U. S. Coast Survey; A. P. Boller, Chief Engineer of the N. Y. Elevated Railroads; Mr. Wm. E. Worthen, New York, and E. P. Hannaford, Chief Engineer of the G. T. R. The further consideration of the subject was referred to a committee composed of the following gentlemen: Sanford Fleming, of Canada; Charles Paine, of Cleveland; A. J. Cassatt, of Philadelphia; J. Toucey, of New York; J. E. Hilgard, of Washington, D. C.; T. Egleston, of Columbia College, N. Y. City; Gen. Theo. G. Ellis, of Hartford, Conn.; with power to add to the number.

Mr. Buck's paper on the Reinforcement of the Anchorages of the Niagara Suspension Bridge was discussed briefly by Messrs. Chesbrough and Boller, who spoke of it in very eulogistic terms. Mr. O. Chanute's paper on Repairs of Masonry was then read, after which a report of the Committee on Memorial was read and received and the Committee discharged. The Convention adjourned.

THE EXCURSION TO OTTAWA CITY.

To Mr. P. A. Peterson, member of A. S. C. E., and chief engineer of the Q. M. O. & O. R. R., is principally due the organization of one of the most delightful excursions that has ever been accorded to the society. Promptly at 9.30 a. m. on the 16th a special train of Pulman coaches. the luxurious special coach of Mr. E. P. Hannaford, Chief Engineer of the G. T.

R., and a baggage car for the Commissary Department left the Mile End depot of the Q. M. O. & O. R. R., with about 200 excursionists bound for the capital of the Dominion. With the party were the following Canadians: Messrs. Geo. D. Ansley, City Engineer of Montreal; Mr. E. H. Pareut, M. L. Lesage, Mrs. Lesage and Miss Lesage, Mr. E. R. Hannaford and Mrs. Hannaford, Mr. Jno. Kennedy and Mrs. Kennedy, Dr. Harrington and Mrs. Harrington, of McGill University; Mr. S. E. Dawson, Prof. H. T. Bovey, J. L. Light, of Quebec; Thos. White, M. P., and the gentlemen who composed the special committee for the day: Messrs. W. Shanly, Samuel C. Keefer, P. A. Peterson, Sandford Fleming, W. C. Thompson and C. A. Goad. The weather was delightfully fine, the air clear and bracing but not cold, the fields and forests were clothed in their most luxuriant dress, the road was in excellent condition, fast time was made, and every circumstance combined to make the trip exceptionally enjoyable.

The train arrived at Ottawa by 1 o'clock, where the visitors were welcomed at the depot by His Worship the Mayor, Sir Leonard Tilley, Hon. Mr. Caron, and the following reception committee: Mr. Allan Gilmour, Bronson & Weston, lumber manufacturers; Perley & Pattee, lumber manufacturers; J. R. Booth, Esq., lumber merchant; John Rochester, Esq., M. P., lumber merchant; Levi Young, Esq., lumber merchant; E. B. Eddy, Esq., lumber merchant; Gilmour & Co., lumber merchants; David Moore, Esq., lumber merchant; Thos. McKay & Co., flour merchants; Samuel Keefer, Esq., C. E.; T. Trudeau, Esq., C. E., Deputy Minister Railways and Canals; John Page, Esq., C. E., Chief Engineer Canals; G. F. Baillarge, Esq., C. E., Deputy Minister Public Works; F. N. Gisborne, Esq., Superintendent of Telegraph and Signal Service; Col. Brunel, C. E., Commissioner of Inland Revenue; C. Blackwell, Esq., C. E., Department Railways and Canals; Sandford Fleming, Esq., C. E., C. M. G.; Thomas C. Keefer, Esq., C. E., C. M. G.; Walter Shanly, Esq., C. E.; Frank Shanly, Esq., C. E.; Thos. S. Scott, Esq., Chief Architect Public Works Department; H. F. Perley, Esq, Chief Engineer Public Works Department; Collingwood Schreiber, Esq., Chief Engineer Canadian Pacific; W. P. Anderson, Esq., Deputy Minister Marine and Fisheries; Col. Dennis, Deputy Minister of Interior; W. B. Smellie, Esq., C. E., Canadian Pacific Railway; F. A. Wise, Esq., C. E., Superintendent Rideau Canal; C. H. Mackintosh, Esq., Mayor of Ottawa; Lindsay Russell, Esq., Surveyor-General; Leonard G. Bell, Esq., C. E.; J. G. Macklin, Esq., C. E.; William Kingsford, Esq., C. E.; R. C. Douglass, Esq., C. E., Department Railways and Canals; J. Tomlinson, Esq., C. E., Department Railways and Canals; T. Ridout, Esq., C. E., Department Railways and Canals; G. P. Brophy, Esq., C. E., Ottawa River Works; Robert Surtees, Esq., City Engineer, Ottawa; James Goodwin, Esq., Ottawa; William Davis, Esq., Ottawa; Francis Clemow, Esq., Ottawa.

Carriages to accommodate the entire party were in attendance, and after a visit to the saw-mills of Messrs. J. R. Booth, and Perley & Pattee, the sash factory of Mr. E. B. Eddy, a good view of the Chaudiere Falls and a voyage down a "slide" on timber cribs, the excursionists were driven through the principal streets of the city, through the grounds of Government Hill, where a fine view of the beautiful landscape surrounding Ottawa City is obtainable, to the Grand Union Hotel, where the grand climacteric in the shape of a substantial lunch had been provided for two hundred and fifty guests. The dining hall of the hotel was tastefully decorated with flags, the tables were laid with fine service, and beautifully ornamented with flowers. Music was furnished by the Guards String Band. The following was the

MENU.

POTAGE.
Mock Turtle. Consommé Julienne.
SAUTERNE. SHERRY.
POISSON.
Boiled Salmon, Potato Duchesse.
ENTREES.
Filet de Bœuf aux Champignons. Patties à la Financière.
Mayonaise of Lobster Salad.
LOUIS ROEDERER. POMMERY AND GRENO. PIPER HEIDSICK.
RELEVES.
Bœuf Roti. Spring Lamb, Mint Sauce.
Roast Turkey.
ENTREMETS.
Boudin de Raisin. Boudin de Carolina.
Rhubarb Pie. Marmalade Tart.
Gelées à la Californienne. Charlotte Russe à la Vanille.
Crême à la Vanille.
CLARET: MARGEAUX.
DESSERT ASSORTI.
Strawberries, Crême. Café.

The Mayor occupied the chair, and the vice-chairs were filled by Messrs. Sandford Fleming, W. B. Smellie, H. F. Perley, and R. Surtees.

"Yankee Doodle" and "The Star Spangled Banner," by the band, were loudly cheered.

At the conclusion of the lunch the following toasts were proposed: "The Queen," which was honored with warm cheers; National Anthem by the band. "The President of the United States" was enthusiastically received; "Hail Columbia" being played by the band. Hon. Mr. Smith, American Consul at Montreal, made a suitable response, referring to the kindly feeling existing between the Canadian and American people. "The Governor-General" was duly honored; the "Campbells are Coming" by the band.

The Mayor then proposed the toast of "The President and Members of the American Society of Engineers," and coupled with the sentiment the names of Gen. Ellis and Secretary Bogart.

Gen. Ellis, in response, said that he was a little afraid that the invasion of a society like this might be regarded in a somewhat different light from what they intended it, but when he arrived in Montreal and saw the reception given to them, his doubts were entirely removed. (Applause.) He spoke in high terms of the reception which had been given them, and said in conclusion that whenever any inhabitant of Canada visited the United States they would receive him with as warm a heart and with as open arms as they themselves had been received in Canada. (Applause.)

Mr. Bogart said that in former years it had always been observed that the last convention was the best, and certainly this, the last, was the best of all. (Applause). A visit to Westminster Abbey had led him to conclude that English people appreciated civil engineers, and his present visit to Canada had confirmed that impression. He thanked the assemblage sincerely for the enthusiasm with which they had drunk the toast.

The Mayor then read the following address on behalf of the corporation of the city:

To the President and Members of the Society of American Civil Engineers:

GENTLEMEN: On behalf of the Corporation we welcome you to the capital of the Dominion, and only regret that the pressure of your engagements precludes the possibility of a more tangible manifestation of regard and appreciation. The splendid engineering triumphs achieved by you and those you represent throughout the United States, the record of active, indomitable zeal and intellectual exertion productive of such wonderful progress is stamped upon every page of your country's history, while the practical result will remain as a monument commemorative of the intelligence and civilization which mark the 19th century. Be assured that we are not unmindful of what Canada owes to those who have set so noble an example in the field of scientific research, and we shall ever retain a kindly and generous sentiment toward the distinguished visitors in Ottawa to-day.

Signed on behalf of the Corporation,
C. H. MACKINTOSH, Mayor.
W. P. LETT, City Clerk.
OTTAWA, June 16, 1881.

President Francis responded briefly.

An exhibition of the fire department was then given in front of the hotel, and after a brief visit to the interior of the Parliament buildings, and an inspection of the pumping machinery of the water-works, and witnessing a column of water thrown fully 200 feet high from a 4-in pipe at the surface of the ground, the party returned to the depot and their train which left at 6.30 p. m., amid loud cheering from the excursionists and their friends in Ottawa. The train was halted on the Chaudière Bridge (described in ENGINEERING NEWS of the 11th) to allow an inspection by those interested, after which fast time was made and Montreal was reached by 10 o'clock.

The forethought and skill that planned the excursion, the generosity that made it a possibility, the overflowing hospitality of the citizens of Ottawa and the hearty good feelings and courteousness that characterized the proceedings of the entire day will ever be remembered in the annals of the American Society of Civil Engineers, and the outcome for good that such a meeting of good fellowship will engender it is difficult to estimate. Wherever the recent visiting members may go they will always have only the warmest of friendly feelings for their late generous Canadian hosts.

At the morning session on Friday, the Chairman suggested that a committee should be appointed to draft a reply to the address of the Mayor and Corporation of Ottawa. A motion empowering him to appoint the committee was adopted.

A telegram was read from Atlanta, Ga., inviting the members of the Society to visit the exposition to be held in that city during the last three months of the present year.

The Secretary was instructed to acknowledge the receipt of the telegram and return the thanks of the Society for the courtesy extended to them.

LIGHT AND HEAVY RAILS.

Mr. Ashbel Welch read a paper upon the Economy of Light and Heavy Rails, the discussion of which was postponed.

The convention then went into business session, with President Francis in the chair.

THE TESTING OF CEMENTS.

The Clerk announced that there were no new candidates to be balloted for, and proceeded to read the reports of the committee appointed to devise and report a uniform method of cement tests. The chairman and the committee reported progress, and said it had been found that the European practice generally embraced tests of mortar composed of certain definite mixtures by weight of cement and sand; that was to say, one weight unit of cement with one, two, three or four units weight of sand. No one could question the advisability of testing mortars containing the sand mixture, as in practice the bulk of our mortars was largely composed of sand. It had been the desire of the committee to so perform their duty that whatever test they might recommend it would be one from which the results of different experimenters could be compared in arriving at a correct opinion of quality, and that the system might be one that in a few years the Society would not be compelled to change. In view of the difference in the practice of making American cements, and the variability of the sand employed in weight, in fineness and sharpness, he had devised a scheme for making a collection of sands from different sections of our continent, which he proposed to carefully examine as to sharpness, fineness, voids, weight of equal bulks, etc., so as to proceed understandingly. When ready to commence this inquiry, several domestic afflictions visited his household, and had precluded his giving any further study to the subject. At present he could only say that his knowledge of the subject was so deficient in this and some other particulars that he did not feel it desirable or safe to ask the committee to formulate a system of cement tests such as would be demanded, and such as would suit American products and practice. With more knowledge and under favorable circumstances which he trusted to secure during the present year he hoped to feel competent to aid any committee the convention might continue or appoint for the purpose, in defining a proper mode of conducting tests of cements.

The report was received and the committee continued.

Mr. J. D. Whittemore, of Milwaukee, also reported that he desired to procure from several localities, throughout the United States and Canadas, specimens of sand, ordinarily used for the fabrication of cement mortars, for the purpose of investigating their properties as to fineness, weight, voids, etc. He requested that specimens should be sent him by express, from different localities, of sharp bank sand, and shore-washed, or water-worn, sand.

The request of Mr. Whittemore will be published in circular form and distributed throughout the country.

THE PRESERVATION OF TIMBER.

The Secretary reported that the committee on the preservation of timber had simply to report that they were collecting a great many samples of timber from various parts of the country, and had no final report to make.

The report was received and the committee continued.

TESTS OF IRON AND STEEL.

The chairman of the committee on ore tests of iron and steel reported that the United States Board appointed to test American iron and steel was legislated out of existence just as its labors, which promised to be invaluable, had fairly commenced. By far the best testing machine in the world has been constructed and erected under the direction of this board and with funds appropriated for the purpose by Congress at the earnest solicitation of various scientific societies and institutions. The scientific and technological schools and colleges of the whole country joined earnestly in recommending and urging these appropriations, which recommendations clearly indicated the general interest felt throughout the country in the effort to obtain such accurate knowledge of the questions of the iron and steel used in the United States, as would guide to their safe employment for all the purposes to which they are applied in the trades, arts and industries of the country.

The legislation obtained and the organization of the boards and the investigation and experiments planned by it were broad and comprehensive, but repeated efforts were made to subject the board to the control of the Ordnance Department of the United States Army. This the committee believed would have resulted in injurious limitations upon the labors of the board, and would have been unjust to the engineer officers of the United States Army, to the officers of the United States Navy, and the members of the board. The committee therefore recommended that a memorial and petition to Congress be prepared and signed by the officers of the American Society of Civil Engineers, setting forth the history of the effort made to secure a complete set of tests of iron, steel and other materials used in construction in this country, and praying that the board legislated out of existence be reappointed, the testing machine built under its direction restored to its possession, and that additional appropriation be made to enable the board to complete its labors. If this recommendation were adopted and carried into effect the committee also recommended that every member of the Society should take an active personal interest in obtaining the favorable action of Congress upon the petition, and that the Society as such should ask the active co-operation in this effort of all the recognized societies and colleges, and all the associations of tradesmen, mechanics, engineers and manufacturers in our country. Appended to the report was a table and cylinder tests prepared by Col. T. T. S. Laidley, of the Ordnance Department of the U. S. Army.

Mr. Boller (New York) said there was no scheme that had been started for the advancement of American engineering comparable with the work laid out for the investigation of that commission. The work was above private effort and must in order to reach a successful result receive hearty government co-operation. He thought it desirable, therefore, that the report should be referred to the Board of Direction to examine into the inferences of existing jealousies contained in the report. He made a motion to that effect, moving at the same time that the report be received and the committee discharged.

The Chairman doubted the propriety of one committee being appointed to report upon the action of another committee.

After some further discussion the following amendment by Mr. Collingwood was adopted: "That a committee be appointed to examine further into the subject and report a recommendation to the board of directors and to take such further action as they see fit."

GAUGING STREAMS.

Mr. Croes, chairman of the committee on gauging streams, reported that considerable correspondence had been had with members in various portions of the country, and effort had been made to procure promises from members to make gauges of the currents of streams in various parts of the country. No response had been received except from Boston. The result of the applications to other parts of the country had not been as satisfactory as could have been desired. The committee therefore simply reported progress.

The report of the committee was received and the committee continued.

THE METRIC SYSTEM.

Mr. Latimer moved that the resolution placed on the transactions of the Society at the ninth annual convention, held in New Orleans, requiring members in presenting written papers to include dimensions in metric measure as well as in English feet and inches, be rescinded.

The Secretary, in reply to Mr. Ellis, said that during his term of office in only two instances had the provision of the resolution been complied with.

Mr. Boller thought that a resolution which was practically a dead letter should not remain upon the Transactions.

The resolution of Mr. Latimer was carried by a vote of 8 to 28.

Mr. Keefer, the President of the covention, then resumed the chair, and the following committee on appointments was elected: William E. Worthen, New York; John Kennedy, Montreal; John McLeod, Louisville; Col. A. F. Wrotnoski, New Orleans; Moses Lane, Milwaukee.

The convention then adjourned.

IN THE AFTERNOON.

The members of the convention took the steamer Filgate for a trip on the river. Among those present were Messrs. Andrew Robertson, chairman, and Hugh McLennan, of the Board of Harbor Commissioners, Alderman Hood and the members of the local committee. The steamer went down the river to the foot of the current and came up hugging the shore to give those on board an opportunity of viewing the new works of the Q., M., O. & O. Railway. They then went up to the locks and witnessed the hanging of the new gates of the Lachine Canal. The canal office distributed to the visitors a very interesting history of the works on the canal from the time of the first opening of a boat canal by the Sulpicians in the year 1700, when the depth of water was but two and a half feet. After the operations were concluded the visitors re-embarked and were taken up to the basin in front of the Grand Trunk Railway offices. They then took a train provided by the G. T. R., and went to the Victoria Bridge, which they inspected with interest. The gold rivet driven by the Prince of Wales was pointed out to them. Returning, the visitors went to the workshops of the railway, and were shown through the various departments. Refreshments were then served in the lecture room of the Grand Trunk, the band meanwhile discoursing an excellent programme. The visitors, re-entering the train, were next taken to the water-works, and after being shown over them returned by train to Bonaventure station, which was reached shortly before 7 o'clock.

THE RECEPTION.

In the evening a society reception was held by Mr. and Mrs. Francis in the parlors of the Windsor Hotel, and a large number of ladies and gentlemen were present. Refreshments were provided in the main dining-room, and at intervals there was dancing in the corridor to the music of an excellent band. There was also some singing by the guests, and a very pleasant evening was spent. Among those present were: Principal Dawson, Gen. Smith, U. S. Consul; Prof. Bovey, Prof. Harrington, Prof. Boyce, Dr. Sterry Hunt, Hon. P. Mitchell, Messrs. S. E. Dawson, Thos. White, M.P., John Kennedy, P. A. Peterson, F. W. Henshaw, E. P. Hannaford, G. Boivin, H. O. Shorey, Frank Redpath W. J. Spicer, Herbert Wallace, Andrew Robertson, Thos. Judah, Walter Shanly, Thomas McDougall, G. D. Ansley, L. Lesage, C. E. Goad and John James Hunt.

After witnessing the working of a fire brigade, the

SATURDAY SESSION

of the convention was called to order at 10:30, Mr. Thomas C. Keefer in the chair.

It was resolved that the thanks of the American Society of Civil Engineers, in annual convention assembled, be returned to the several corporations, committees and individuals who have by their kind feelings, courtesies and liberality, shown their interest in the Society, and contributed so largely to the enjoyment of its members on this occasion, and that the Secretary be directed to communicate to each of the same a copy of this resolution.

The Chairman said that this resolution did not include the formal address of the Corporation of Montreal by the Mayor, because that was replied to by the Vice-President of the Society, Mr. Welch, at the time, but he thought that perhaps it would be well to include in the resolution a reply to the address of the Corporation of Montreal.

Mr. Davis moved that this be included in the resolution. Carried.

PHŒNIX COLUMNS.

A paper was presented by Mr. T. C. Clarke on "Wrought Iron-Columns," which includes a record of a number of tests on full-size Phœnix Columns.

Mr. Amory Coffin, of the Phœnix Iron Works, Phœnixville, Pa., made a few remarks on the subject.

COPPER-TIN-ZINC ALLOYS.

A paper was then presented by Prof. R. H. Thurston on the "Strength and Ductility of the Copper-Tin-Zinc Alloys," which was the result of a number of experiments on the subject.

SEWERAGE SYSTEMS.

Mr. R. Hering, of Philadelphia, then read a paper on "Systems of Sewerage." Mr. Hering was sent to Europe a little more than a year ago by the National Board of Health of the United States and the city of Philadelphia to make a report on the sewerage systems of that continent. He is now at work on his report, and it will be the first since Mr. Chesbrough made his report in 1855. Mr. Chesbrough's report is now out of print, and cannot be had at any price. Mr. Hering is Assistant City Engineer of the city of Philadelphia, and has had charge of the sewerage there for many years past. He has thoroughly studied the subject, and has written largely for the numerous papers and publications of the engineers' societies of the United States, and is consequently an authority on the subject. The following is the paper:

Having recently made an examination of the city sewerage works in Europe, and in view of the differences of opinion still existing with regard to the proper methods both here and abroad, I have prepared a paper containing the conclusions which my inspection forced upon me. Being under the impression that the ten-minute rule applied to papers as well as discussions, I have brought with me simply an abstract. In general, I may state that these conclusions embody nothing essentially new, but simply confirm either one view or the other.

While visiting the different towns and conversing with the gentlemen interested on the subject, I found how strikingly professional occupations influenced opinions, and it seems to me that in this—what we might term "professional bias"—lies one of the difficulties in fairly judging the different systems. Engineers generally favored sewerage, whereas chemists, agriculturists, etc., hold dry removal to be better from a sanitary and economical point of view. Again, municipal engineers, especially of large cities, indorsed the "combined" system of water-carriage, by admitting the sewage and rain water into the same channels, whereas others preferred to separate them. Each person judges matters from his own sphere of working, and by considering this bias we may advance a step toward a truer conclusion. Our opinions on the relative merits of designs are also misguided by circumstances—of which outsiders are not always familiar—such as the quantity and quality of previous sewerage works of a town, its physical features, the customs of the people and the difficulties of altering old practices or laws.

With these points held in view, I have given a general description of the several systems of removing offal and waste water and examined them under two aspects, namely, the sanitary value and the cost. While the former should reach a satisfactory standard in each case, the latter will vary according to the different systems, localities and various other conditions.

In the main there are two methods, the dry removal and water-carriage. The first is accomplished by temporary storage or disinfection in ample receptacles frequently exchanged; then of immediate and continuous self-removal. The best appliance for disinfection I found to be the well-known dry-earth closet, and, when properly managed, it offers no sanitary objections, but the expense greatly limits its application, and it can only be economical in small country towns or isolated buildings with a regular water supply or sewerage. The appliances for sewerage without disinfection are casks and pails. They are very common in Europe, and have in some places been given the preference over all other methods. However, in order to compare favorably with water-carriage, they must be very carefully attended to, and even then can only be economical in small towns and localities, which are more expensive to sewer. The other method, namely water-carriage, or sewerage proper, is accomplished by continuous underground channels leading from the dwellings to the places of final disposal. Two systems are common, the so-called "combined," where the sewage and rain water are allowed to go into the same sewers, or the "separate," where the latter is excluded, and runs into different channels. As in the case of dry removal and water-carriage, so opinions differ as to the applicability of these two systems. In order to reach conclusions, a glance is given at some of their guiding principles, the oversight of some of which, I believe, has caused not only a failure to satisfy sanitary and engineering demands, but also attacks upon the systems themselves. They are as follows: The general alignment is effected and modified by the manner of ultimate disposal and by topographical features. Different types are, therefore, necessary to suit different circumstances, such as the valley line sewerage, with frequently single or any interception, and the so-called radial system. The following special principles were observed to be of importance, namely, the necessity of laying sewers in straight lines with manholes or lampholes at either bend; the economical disposition of sewers so as to lead as many as possible together in the mains, from the fact that a sewer of x times the capacity will not cost x times as much; the equalization of velocity for abrupt changes of topography by giving sewers greater length in the steeper grounds; and, finally, the avoiding of ends, by the Frankfort system of alignment.

In considering the gradients, a distinction should be made between the ordinary and storm waterflow, the former receiving its velocity from the grade of the invert, the latter frequently from a head equal to the difference of water level at the upper head and the outfall. The former deter-

mines the minimum grade of the sewer, the latter the size.

Mr. Burkli Zeigler's new formula for proportioning the rainfall reaching sewers from different areas, as derived from observations, is recommended. Then the advisability of keeping rainwater on the streets as long as possible, especially near the watershed line, is shown, with reference to a reduction of the size of sewers. Then the great value of the smoothness of the interior surface is urged, as affecting the sanitary condition, as well as the velocity, of which the great sewers in Paris, Vienna, London and Zurich give good evidence. The applicability of sewerage nooks, when carefully designed and built, is only limited by the absence of a regular water supply or by certain topographical features, where the expense would be much greater than for dry removal.

It now remains to draw a few comparisons between the different systems, and, in so doing, it is premised that each one is designed, executed in a reasonably approved manner. They are compared, first, from the sanitary point of view, and then as to their relative expense. An inspection of the best examples will, I believe, convince one that each can be made to answer the sanitary demands within satisfactory limits. Among the water-carriage systems there is little difference, if they are equally well built and maintained. The Liernur method is least satisfactory, because the use of water is limited, and many foul substances are left to enter the rainwater channels. The ordinary separate system is approved, from a sanitary point of view, whenever rainwater does not need exclusive underground removal, or when an equal relief is required. Its advantages have been found to be as follows: The smaller pipes increase the possibilty of stoppage and disorder, and decrease the facilities for cleaning. Duplicate sewers for sewerage and rainwater have also been the cause of erroneous connections, and, if not absolutely water-tight, have acted and reacted on each other under the street.

The "combined" system, on the other hand, is best for large areas of thickly populated surfaces where underground rainwater removal is required. It has the advantage of being only one system of sewers, which also facilitates maintenance. Sanitary imperfections occur only when it is wrongly designed and badly built or maintained, difficulties to which the duplicate system is also exposed; and from its greater complications, even in a greater measure. The comparison of the relative cost of the different systems depends so much on local conditions that it is impossible to state more than very general results. For a town where, from its position, water supply and density of population, water-carriage is at all practicable, it will be less expensive than dry removal, provided the latter is kept up to a good sanitary standard.

Among the water-carriage systems this relative economy can be decided as follows: Where stormwater must be carried away under ground, as in very extensive and closely built-up districts, and when new sewers must be built for this purpose, as is generally the case in large or rapidly growing cities, the combined system will be the most economical.

Where stormwater can flow away in existing sewers which are unsuitable for the proper conveyance of sewage, or where it can be scattered in a few channels slightly built, or finally can be allowed to run off over the surface, it will be more convenient to adopt the separate system, *i. e.*, to exclude the rain water from the sewers receiving the house drainage. Its advantages will generally be found in towns which have an old system of valley line sewers or have drainage area which are very short, very steep, or are so flat and low that any sewers can get an outfall without pumping, and finally in rural districts, where the population is scattered. When, in the separate system the sewers for rainwater alone must convey practically as much water as those of the combined, under the above conditions, and works to this effect have to be built anew, there can be no doubt of the greater expense, and although frequently perhaps under the presumption of obtaining greater sanitary benefits, such a duplicate system has not yet been carried out, and according to the above conclusions does not seem warranted.

It is possible further to make a combination of both systems in the same town. On some areas it will be found expedient to exclude rainwater and carry it on the surface to a near water-course; on others, which are longer and include closely built-up territory, the combined may be advisable, and the sewage of both can be united and continued in the same channel. Liernur's separate system was found to be the most expensive to construct, as it required an iron pipe in every street, and frequently, besides, a system of ordinary sewers for taking away kitchen waste and rainwater. As to the cost of maintenance, it is more difficult to draw conclusions for new cases; but, generally speaking, we can say that it is cheaper to maintain the combined system because there is only one set of sewers, and being dry, they are easier to inspect and less likely to get stopped. Expenses of flushing will generally be the same in both, but the combined has the additional advantage of the scouring of heavy rains. The Liernur system, again, is also the most expensive to maintain, as the motion of the liquid is produced by artificial power instead of gravity, even where the latter can operate alone on a down grade; yet this greater cost will be somewhat relieved, as the pipes do not require flushing or cleaning.

Finally, it may be said that none of the above systems will be applicable for all towns, but different extraordinary conditions will demand as radically different sewers, both in general and detail. The dry removal and the separate and combined water-carriage will each be satisfactory when confined to certain limits, and where each one will have advantages over the rest.

When it is urged, at present, that a radical change is necessary in our method of sewerage, and that, for instance, the separate system should be adopted under certain conditions for which we have designated the combined, it rather seems that this radical change is more necessary, and will produce more beneficial results in the direction of improving the details of design, construction and maintenance of the latter, the neglect of which has been the main cause of its shortcomings. And this greater attention and care should, in fact, be no less imperative with the separate and all other systems.

But another change seems to be more urgent. Although professing to favor water-carriage, the prevailing method in most American cities is still the use of the most objectionable ancient cesspools under or near our dwellings. To abolish them where sewers are within reach, by substituting a carefully planned house drainage, will do more toward raising the sanitary condition of communities than the supposed difference between the general systems of drainage which presents mainly a question of cost, because both may be equally good when well designed and managed, and equally bad when neglected.

The Secretary read answers from several gentlemen in different parts of the country to questions relating to sewerage.

WEIGHTS AND MEASURES.

Mr. C. Latimer, of Cleveland, then delivered a very interesting address on "Weights and Measures—the British inch, the most ancient and most precious legacy of our forefathers." He said the British inch was the great antagonist of the French metric system. He did not think the British inch would ever be abolished; in fact, it was now used in Paris, France. In his opinion the Anglo-Saxon measures would predominate, because they were founded upon a rock. Most people thought the British inch was three barleycorns, but they made a mistake. If he were not able to prove that the British inch was of the greatest antiquity he would be willing to adopt the French meter. Whether it be that our calendar and weights and measures were given direct by inspiration, or were reached by the study of ages, one thing he found was that in a building constructed over 4,000 years ago, the great pyramid of Egypt, they were to-day found in all their perfection. The British inch, as it stands to-day, was the principal measure used in its construction. He proved conclusively, by a mathematical demonstration, that the British inch had been used in the construction of this great pyramid. This naturally led us back to the question of who built that pyramid. He thought that, when once the Anglo-Saxon people understood the value of their measures, they would not be so ready to part with them, and he hoped what he had said would lead to their looking into the matter more closely.

Mr. Welch, Vice-President, asked Mr. Latimer whether the British inch had always been the same in historical times as now?

Mr. Latimer replied that there was a slight difference. The pyramid inch was one-thousandth part greater than the British inch.

Mr. Brooks, of Boston, an advocate of the French metric system, replied briefly to Mr. Latimer.

COMMITTEE ON TESTS OF IRON AND STEEL.

The following gentlemen were appointed a committee to investigate the subject of tests of iron and steel: Messrs. T. Egleston, A. P. Boller, F. Collingwood, T. C. Clarke and W. Metcalf.

The convention then adjourned.

THE LACROSSE MATCH.

The delegates and their lady friends visited the Shamrock Lacrosse Grounds in the afternoon to witness the Lacrosse match between the Montrealers and the Shamrocks.

About fifty of the delegates left for Quebec on the ten o'clock G. T. R. express on Saturday night for Quebec, sleeping cars having been placed at their disposal by the Grand Trunk authorities.

EXCURSION TO QUEBEC.

By the kind invitation of Mr. John Kennedy, Harbor Engineer of Montreal, the following ladies and gentlemen were accorded the rare privilege of a daylight trip by steamer from Montreal to Quebec: Mrs. Redpath, Miss Redpath, Prof. Bovey and Mrs. Bovey, Mrs. Kennedy and Miss Kennedy, of Montreal; Mrs. Hering and Miss Gregory, of Philadelphia; Prof. Egleston, of Columbia College, C. Constable, of Constable, N. Y.; Ashbel Welch and Miss Welch, of Lambertville, N. J.; Miss Welch, Frankfort, Ky.; C. D. Ward and S. B. Ward, Jersey City; Jorgen Dahll, of Christiana, Norway, and Geo. H. Frost, of New York City. The government steamer John Brown, with the party on board, accompanied by their host, left the foot of the Lachine locks at 9 a. m.; the weather was variable, cool but without rain, and the party were enabled to be on deck throughout the whole passage. Calls were made at several of the principal dredgers at work between Montreal and Quebec, and the operation of dredging in silt, bowlders and slate rock was witnessed. A most liberal supply of commissary stores had been provided for the trip, and what with the bountiful hospitality in the cabin, the delightful scenery of the route, and the agreeable companionship on deck, the day wore rapidly away. On account of the opposition of wind and tide the landing at Quebec was not made till 1 a. m., Tuesday, when most of the party sought the rooms at the Hotel St. Louis previously engaged. Tuesday forenoon was spent on board the steamer in a visit to the extensive harbor improvements, thence to falls of Montmorency and return, after which the party separated, with many expressions of esteem for their kind host and most charming and agreeable hostess, who had contributed so much to render the entire visit to Montreal a continual delight. The afternoon in Quebec was spent in driving about the city and suburbs, through the burnt district to the Citadel and visiting the churches. At 10 p.m., in company with several of the party, we left the city by the Quebec, Montreal, Ontario & Occidental Railway, reaching Montreal in time to breakfast and take the Grand Trunk Railway for New York by the Delaware & Hudson Canal Co.'s route through Saratoga to Albany, and thence by Hudson River Railroad to New York, which city we reached at 10 p. m. Wednesday, at which time our convention trip came to a close. Our columns are so full this week that we leave to our next issue any remarks upon the convention that we feel like presenting to our readers.

MEXICAN NEWS.

A dispatch from Mexico to the *World* announces the concession by the Mexican President to an American company of a charter for building a line of railway from Piedras Negras in Eastern Mexico to Topolovampa in Western Mexico. As Mexican geography is not quite as well known to Americans in general as the geography of Central Africa, it may be proper to state that such a road as this, were it built, would be a new transcontinental line between the Atlantic and Pacific, terminating at a port regarded by many persons as the finest on the western coast of North America.

The Mexican National railway, better known as the Palmer-Sullivan road, has begun construction beyond the Rio Grande in Mexico. This is the first American railway ever started from the Rio Grande on Mexican soil.

There are at present in the Old World and in the New World more than 100,000 railway locomotives. Their total force is equal to 30,000,000 horse-power, and all the other steam engines on the globe are estimated at 46,000,000 horse-power. The technical "horse-power," however, is really equal to three average horses, and each horse to about seven men; the aggregate power, therefore, of all the engines being vastly more than the effective force of all the human workers living. Four-fifths of the steam engines now at work have been made within a quarter of a century or so.—*Exchange.*

RENSSELAER POLYTECHNIC INSTITUTE COMMENCEMENT.

FIFTY-FIFTH ANNUAL COMMENCEMENT.

Commencement week at the Rensselaer Polytechnic Institute in Troy began on Sunday, the 12th inst., and the closing exercises were held Wednesday evening, the 15th inst. The interesting programme attracted many of the alumni and former students of the Institute, as well as the friends of the members of the graduating class, while more than the usual interest seemed to be manifested by the residents of Troy.

The baccalaureate sermon was delivered Sunday evening in the First Presbyterian Church by the Rev. Dr. Webber. His discourse abounded in eloquence and sound advice. Referriug to the choice of a profession he spoke as follows: "It is absolutely necessary to success to find one's proper sphere in life, and assuming that your studies have discovered in you a fitness for the profession you have chosen, I congratulate you upon your choice, for it is a noble and useful occupation. Do not be discouraged by the difficulties you may meet in getting under way. Experienced talent has the field; skill has to prove itself before it can win appreciation. If opportunities are not hopeful other employments may tempt you, but heed them not. The man who shifts from one thing to another never accomplishes anything. Be self reliant and have such faith in your special calling as conquers obstacles. Cultivate an enthusiasm for your profession. He who does not prize his art above profit or fame had better quit it at once. But your culture should be broad. The proper place of a school of civil engineering is beside the post-graduate schools of the universities, such as law, medicine and theology. Why should not a civil engineer feel an enthusiasm in his pursuit second to no other? Is he not one of the mighty agents in the world's civilization? The art of civil engineering divides space, multiplies time and brings scattered peoples into contiguity. He is the workman Providence employs to fulfill the prophecy of old: 'Every valley shall be exalted and every mountain and hill shall be made level, and the crooked shall be made straight and rough places plain.'"

On Monday and Tuesday the students of the graduating class read their theses in public, in Institute Hall. The papers were creditably prepared and were fully illustrated by large drawings. The cross-examinations by the faculty and visitors showed in each case a thorough understanding of the subject treated. The following are the names and residences of the graduates of this year, and the subjects chosen for the theses:

Review of the Corliss Steam Engine of the Trenton Iron Company, Trenton, N. J.; J. S. Chambers, Jr., Trenton, N. J.

Review of the Overshot Water Wheel of the Co-operative Chair Company at East Templeton, Mass.; Virgil H. Hewes, Sacramento, Cal.

Review of Wrought-Iron Bowstring Girder Bridge, over the Champlain Canal, at Bemis Heights, Saratoga County, N. Y.; R. P. Bloss, Troy, N. Y.

Review of the Sub-structure of the International Bridge, over Niagara River, at Black Rock, N. Y.; Taro Ishigro, Hikone, Japan.

Review of a Double Intersection Combination Bridge, designed by the Council Bluffs Bridge Co., Council Bluffs, Ia.; Palmerio de Cavalho Cantanhede, Maranhao, Brazil.

Review of Wrought-Iron Deck Bridge on the Boston, Hoosac Tunnel & Western Railway, at Schaghticoke, N. Y.; G. W. G. Ferris, Jr., Carson City, Nev.

Review of Wrought-Iron Trapezoidal Truss Bridge, over the Champlain Canal at Fort Ann, N. Y.; W. B. Cabot, Brattleboro, Vt.

Review of a Locomotive Boiler designed by Mr. W. Eddy, Master Mechanic Boston & Albany Railroad, Springfield, Mass.; Thomas D. Whistler, Baltimore, Md.

Design for a Stone Bridge over the Yumuri River, Matanzas, Cuba; A. N. Menocal, Guanabacoa, Cuba.

Design for a Wrought-Iron Viaduct over Quassaic Creek, on the highway between Newburgh and New Windsor, N. Y.; W. S. McCord, Peekskill, N. Y.

Review of the Troy Steam Heating Company's Works, Troy, N. Y.; G. D. Baltimore, Troy, N. Y.

Review of the West Arch of the Cleveland Viaduct, Cleveland, Ohio; C. P. Ruple, Cleveland, Ohio.

Review of an Arch of the Filbert Street Viaduct, constructed by the Pennsylvania Railroad Company at Philadelphia, Pa.; John J. Henry, Germantown, Pa.

Review of the Barnum Richardson Company's Blast Furnace No. 1, at East Canaan, Litchfield Co., Conn.; T. V. Church, Troy, N. Y.

Review of Wrought-Iron Lattice Bridge over the Hudson River at Lansingburgh, N. Y.; Henry W. Verner, Pittsburgh, Pa.

Review of the Holly Pumping Engines of the Troy Water-Works; Geo. A. Just, New York City.

Review of the Hudson River Tunnel between Jersey City and New York; Wm. H. Breithaupt, Berlin, Ontario.

Review of the Boilers and Chimney of the Troy Water-Works, Lansingburgh, N. Y.; E. B. McNeill, Litchfield, Conn.

Subject not announced; F. de A. Cintra, San Paulo, Brazil.

Design of an Overshot Water Wheel; Thomas H. Rainsford, Trenton, S. C.

Tuesday evening an alumni reception was held in Harmony Hall, and was attended by about 125 gentlemen, there being present besides the alumni many of the prominent citizens of Troy. The following are the names of some of the alumni who were present:

Francis Collingwood, President of the Association, Assistant Engineer of the East River Bridge, class of '55; E. V. Z. Lane, Treasurer of the Mapes Formula and Peruvian Guano Company, New York; Henry Shaw, of the Albany and Rensselaer Iron Works; William M. Allaire, Assistant in transporting the Obelisk; David Reeves, President of the Phœnix Iron Company, Philadelphia; W. H. Reeves, of the Phœnix Iron Company; George Griffin, of Phœnixville, Penna.; Dr. J. G. Ambler, of New York, and the eldest graduate present; Prof. James Hall, of Albany, State Geologist; Warren T. Kellogg, of Lansingburgh; Joseph E. Waltz, of Dayton, Ohio; Frank E. Platt, in charge of the blast furnace of the Franklin Iron Works, Oneida County; W. J. Babcock, of Chester, Penna.; Frank L. Rowland, Assistant Engineer of the East River Bridge; James P. Wallace, of New York; E. W. Armes, George W. Carnick, Elias P. Mann, Charles T. Raymond, George B. Wellington, John R. Squires, Dr. J. P. Bloss, of Troy; Isaac W. Frank, Assistant Engineer Richmond & Allegheny Railroad.

The following are a few of the more prominent gentlemen of Troy who attended:

The Hon. Martin I. Townsend, B. H. Hall, the Rev. Dr. Harison, R. M. Townsend, William H. Hollister, Jr., L. D. Eddy, F. A. Sheldon, Ebenezer Warner, Fred. P. Allen, J. J. Tillinghast, the Rev. Mr. Snively, C. E. Wellington, E. W. Boughton, William E. Hagan, John Burden, the Rev. Dr. Webber, Dr. C. C. Schuyler, Dr. S. D. French, D. W. Ford, Col. George Babcock, Charles W. Tillinghast, the Rev. Mr. Fish, A. M. Knowlson, Ex-Mayor William Kemp, J. P. Wallace, the Rev. Dr. Tucker, J. S. Knowlson, W. T. H. Doughty, the Hon. James Forsyth, William Gurley and William H. Young.

Of the faculty there were:

Profs. David M. Greene, W. N. Chadwick, D. F. Thompson, H. B. Nason, William P. Mason, William H. Burr, P. C. Ricketts, W. W. Morrill.

To the inspiriting music of Doring's orchestra hosts and guests assembled, and hearty handshakes, greetings and congratulations were the order until 10 o'clock. At that hour, the groups of gentlemen, rehearsing incidents of the days "when we were R. P. I. boys," dissolved upon the call for order by President Forsyth, who, after referring to the pleasant alumni meeting held recently at the residence of the Hon. Clarkson N. Potter, said:

"It was thought that a meeting of the alumni in Troy once a year would cherish and increase the interest in the Institute; hence this brilliant company to-night. This is the occasion for a free interchange of opinion, and having so many prominent gentlemen, graduates of the Institute, with us this evening, I am at a loss to single out from the number those who would entertain you the most. However, I take the liberty to first call upon Francis Collingwood, President of the Alumni Association.

Mr. Collingwood first presented letters of regret from the following well-known members of the alumni:

Prof. S. Edward Warren, of Newton, Mass.; William Metcalf, President of the Crescent Steel Works, Pittsburgh, Penna.; Theodore Cooper, of Scranton, Penna.; O. F. Nichols, of the Trenton (N. J.) Iron Works; G. D. Roberts, President of the Pennsylvania Railroad; John A. Wilson, of the same corporation; James M. Birdsall, of New York; A. J. Menocal, of the Panama Canal project: Prof. Plympton, of the Polytechnic Institute, Brooklyn; Prof. Wood, of Stevens Institute, Hoboken, N. J., and others.

Extracts from several of these letters were read which urged an awakening among the citizens of Troy in the matter of better maintenance of the Institute. Aid, it was stated, could not be expected from outside quarters until the home of the Institute had first been heard from. The objects of the school and the remarkable success of its graduates were alluded to.

Mr. Collingwood then spoke as follows:

I am exceedingly glad to meet with you this evening. I have brought with me a large number of letters expressive of the regret of the writers at being unable to attend, and all indicative of the high esteem in which the Institute is held. I find in these letters that many of the graduates have gone to Europe, and I was pleased to learn that their condition enabled them to make the trip. [Laughter.] Others are in attendance at the engineers' convention at Montreal, while still others have engagements elsewhere.

With respect to the Institute, I would say that after the meeting of the alumni, held in New York last winter, I canvassed the question of endowment among local graduates, and the usual response was: "Troy must move first." Therefore, if the citizens of Troy are anxious that the grand old Institute shall be infused with new blood let them move first and they can rest assured that all the States in the Union will be heard from. Is there any doubt that the Institute will be maintained? From this institution men have gone out who to-day are occupying positions of prominence and trust. I learn that of graduates 41 are now professors, four State geologists, six railroad presidents, four bank presidents, 19 physicians, 22 lawyers, eight clergymen, and a large number are railroad superintendents and chief engineers. Graduates are filling professors' chairs in Yale College, the Navy Department at Washington, Kings' College, England; the Polytechnic Institute, Brooklyn; the State Normal School, Illinois; Cornell University, Swathmore College, Pennsylvania; Johns Hopkins College, Baltimore, and at Princeton and Lafayette colleges. We want to be able to enlarge the Institute buildings and its course of instruction, so as to advance as science advances. In England, naval architecture is a prominent study, and the indications are that it will soon be in this country. We must raise a large amount of money to bring our school up to the required standard, and if I were asked to name an amount that would provide us with our necessities, I would say $500,000.

The Hon. Martin I. Townsend being called upon mentioned as one reason for the maintenance of the Institute that many Troy girls have been invited to desirable homes by graduates thereof. Reference was made to the great railroad work of William W. Walker, a graduate, and this, with remarks concerning other prominent members of the alumni, was received with loud applause. Mr. Townsend favored appointing a committee which should be made to understand that there will be no rest in this world and but little in the next unless the Institute shall be adequately endowed through their efforts.

J. P. Wallace, of New York, followed in brief remarks. He was ready to plead guilty to Mr. Townsend's charge relative to graduates carrying off Troy girls. "And," added the gentleman, "I am sure that were it known what an education and a wife I got while here, those old walls of the Institute would not be able to contain the throng which would apply for admission." The fact that graduates were given the preference in filling positions throughout the country was mentioned as conclusive evidence of the fame and high standing of the institution.

President Forsyth took occasion at this point to

express the conviction that the Institute would live long after the present company had passed away, C. L. MacArthur vouched for the friendship of the local press toward the Institute. B. H. Hall gave a concise history of the 56 years' experience of the institution, and alluded to the fact that within the past few weeks fifty offers of responsible positions to students had been received.

The company then adjourned to the small hall, where an enjoyable repast was served, and the remainder of the evening spent in social conversation.

Wednesday morning the annual meeting of the alumni association was held in Institute Hall. Speeches were made by Dr. Horton, of the class of '27, the oldest living graduate; Prof. James Hall, of Albany; Dr. J. G. Ambler, of New York, and President Collingwood.

The following were elected officers of the Association for the ensuing year:

President, Charles Macdonald; Vice-Presidents, Clarkson N. Potter, David Reeves and Joseph C. Platt; Secretary, H. B. Nason; Treasurer, John Squires; Directors, David M. Greene, E. W. Arms, W. T. Kellogg, W. P. Mason and E. P. Mann.

The meeting was opened to the public at twelve o'clock, when Mr. William M. Allaire, of the class of '76, delivered an address on the subject of the transportation and erection of the obelisk. Mr. Allaire was Lieut. Com. Gorringe's assistant in the work. He illustrated his remarks with large drawings made on cloth and by blackboard sketches.

At half-past two in the afternoon the alumni joined in their annual dinner. On this occasion the subject of the future of the Institute again presented itself and was fully discussed in a very practical manner. Several of those present spoke in favor of earnest efforts being made by the alumni to secure a substantial endowment for the institution which in its long, prosperous and useful life has done so much toward the development of the great interests of the country, and so much toward making civil engineering recognized as one of the learned professions. Plans of operations were discussed and the speakers promised to aid in the effort, not only by argument and solicitation, but also by personal subscription. Mr. Francis Collingwood, of the East River Bridge, was appointed chairman of a committee on endowment, with power to appoint the other members. Mr. Charles Macdonald was appointed chairman of a committee to arrange for an alumni reception in New York some time next winter.

The trustees of the Institute have about completed a subscription of ten thousand dollars, which it is proposed to spend immediately in the purchase of physical, chemical and mechanical apparatus, thus improving greatly the facilities for study and investigation in these departments.

On Wednesday evening the Commencement exercises were held in Music Hall, which was filled with a large and cultured audience. There was a profusion of flowers and the usual number of musical selections. The first colored graduate, Mr. Garnett D. Baltimore, was especially favored with several large floral pieces. There were on the stage, beside the graduating class, the trustees and faculty of the Institute, many of the alumni and several distinguished citizens of Troy. After the President of the Institute, the Hon. James Forsyth, had conferred the degree of civil engineer upon each member of the graduating class, the Hon. Clarkson N. Potter, of the class of '43, delivered a very interesting and forcible address. The following is a brief synopsis of his remarks:

"You may be sure I do not come to these graduating exercises without feelings of emotion. I was for a time a student at the Rensselaer Polytechnic Institute and I recall with pleasure the brief time I was here. I remember with especial gratification the kindness with which I was treated by the people of this thriving city. The man who instituted this school had wise ideas. He foresaw that the time had come when scientific studies were necessary. And where better could such a school have been located than at the tide waters of the Hudson and in this beautiful and prosperous city, the home of thrift, of energy and hospitality. No century has ever made such rapid progress as the present. To this century it was left to unlock the stars, to discern the composition of matter, and indeed it was left for the present century to accomplish everything, from the production of food to the destruction of life. Mr. Potter then reviewed at length the works of the scientists of old and drew comparisons between their works and those of the present time, and spoke of the rapid progress of modern civilization.

In conclusion, he charged the young men to remember that for fifty years able teachers had labored to impart knowledge at the Institute that should fit the students for honorable lives, and everywhere a diploma from the Rensselaer Institute was looked upon with respect. He told them to be wise in all that they did, and wherever they went, in all their walks in life, to let their works reflect credit upon their alma mater.

Upon the conclusion of the commencement exercises, the majority of the audience, together with the students, repaired to Harmony Hall to participate in the farewell hop tendered the graduating class by the members of the junior class. It was a very brilliant affair, and was heartily enjoyed till the early hours of Thursday morning.

Nearly all the graduates of this year go immediately to positions which have been awaiting them for some time.

The demand for graduates of the Institute is far beyond the supply. During the past year the director has been called upon to furnish large numbers of engineers of all grades, from chief of a railroad to rodman; also a superintendent of a blast furnace. Recently the chief of the United States signal service, Gen. Hazen, has called the attention of the authorities of the Institute to the fact that his department offered scientific employment for the men turned out here, and opened a way to admission to the regular army as lieutenants.

Application has also been made by United States engineer officers in charge of the improvement of the western rivers for quite a number of young engineers from the Institute. In this case the requirement is for educated young men, "without the prejudices which come with experience," to engage in the execution of works unlike any hitherto undertaken in this country. The Pennsylvania railroad is also in the field with positions for three graduates, two of which are already filled from the class of 1881, while the third still awaits the search for the right man. Below are the names of the graduates, together with the works upon which they are to be engaged.

Mr. Baltimore, Albany & Greenbush bridge; Mr. Bloss, Denver & Rio Grande Railway; Mr. Breithaupt, Hudson River tunnel; Mr. Cabot, Omaha water-works; Mr. Cantanhede, Council Bluffs Bridge Works; Mr. Chambers, not yet decided; Mr. Church, Albany & Greenbush bridge; Mr. Henry, desires no position at present; Mr. Hewes, Western river improvements; Mr. Ishigro, Pennsylvania railroad; Mr. Just, Phœnixville Iron and Bridge Works; Mr. Menocal, Albany & Greenbush bridge; Mr. McCord, Delaware Bridge Works; Mr. McNeill, not yet decided; Mr. Rainsford, an invalid; Mr. Ruple, Western river improvements; Mr. Verner, Pennsylvania Railroad; Mr. Whistler, goes to Europe; Mr. Ferris, six positions offered; Mr. Cintra, four positions offered.

The foregoing serves to indicate the high esteem in which Troy's famous engineering school is held both at home and abroad.

The Common Council of the city of New London, Conn., recently recommended that an appropriation of 1,100 be made for the purpose of procuring plans and specifications for sewering the city. The sheriff has been commanded to summon the legal voters on June 25 to act upon this question.

SIPHONS.

At a recent meeting of the Polytechnic Association of the American Institute, the President, Mr. T. D. Stetson, detailed some experiments which he had recently made.

The ordinary siphon, consisting of a simple bent tube, acts by the difference of length of the two columns of liquid. There is a tendency to form a vacuum at the top of the tube. The superior gravity of the longer raises the shorter column by the atmospheric pressure. The partial vacuum results in the liberation of the small quantity of air always contained in the water, and the formation of what is known as an air trap.

In attempting to avoid this difficulty by the use of a large vessel or air receiver some curious results were obtained.

The first object was to make a self-emptying air chamber. The plan adopted to accomplish this result was to carry both pipes into the air chamber, and take one to the very top, where it was turned over in such a way as to make a fall of water through the air space when the siphon was in operation. This plan would in all probability be successful in a perfectly-constructed apparatus. In order, however, to observe the operation, Mr. Stetson had made the air chamber of glass, and he found himself unable to preserve a perfectly tight joint sufficiently long to determine the question definitely.

A siphon having a large chamber at the bend, into which one pipe enters at a much higher level than the other, he found developed, with just sufficient air inclosed, the very unexpected property of acting like a check valve. It opposes a greater resistance to the passage of water in one direction than in the other—the difference in resistance depending on the difference of area between the water surface in the chamber and that in the pipe entering at the highest level. In draining marshes on a large or small scale, in draining any area subject to tidal fluctuations or fluctuations from freshets, especially in connecting a cellar drain with the sewer where the sewer is liable to rise and make a back-flow under extraordinary circumstances, this offers a valuable means for opposing the return flow of the water. By properly proportioning the chamber to the pipe, the excess of head necessary to force the water through the wrong way could be made almost anything we please.

Mr. Sutton said that siphons are very interesting pieces of apparatus, and work very curiously. In the early days in California, where capital was abundant but the means limited, siphons were often used to drain mines in the gravel, especially when they came to the bed rock, and tunnels would be necessary to drain the water off in the ordinary way from a rock basin. In such cases the siphons were used to take the water over the "rim of the bed rock."

These siphons almost always stopped working after a little, from an accumulation of air in the bend. They always stopped, in fact, save when they were put in by experienced men. The speaker then detailed an instance where he put in a siphon going over a rim of rock some 150 feet in length. The outside end was of iron pipe, but the inside end was rubber hose. As the works were carried further in, some 250 feet of rubber hose was added; the head being very small, there was but slight tendency to collapse. At each end a stop-valve was placed, and at the highest point there was an air chamber. This was formed of an empty whisky cask, which was a thing easily got and adapted to the purpose. The cask and siphon were filled through a tunnel at the top, the valve on the top of the cask was then closed and the others opened, and the siphon would commence to work. It was necessary to have two valves, one at each end of the pipe, because at that time they could not buy in San Francisco a pump capable of filling the pipe. At night the whole was shut off, and in the morning it was started long enough before work began to properly reduce the water level. The air chamber would fill with air in about two hours, but just before it was supposed to be filled the valves were shut and the barrel filled up again with water through the tunnel.—*Scientific American.*

The New York State authorities have issued an order directing all work on the New York, West Shore & Buffalo railroad within 180 feet of the canal to be stopped at once. If this order is obeyed, operations on nine-tenths of the line between Schenectady and Utica will have to be discontinued, thereby causing great delay in the construction of the road. The road authorities will at once carry the matter before the courts for adjudication, believing that the State officers have not sufficient authority to control the land.

FOREIGN INTELLIGENCE.

The British House of Commons has been illuminated with the Brush electric light. Eastward the course of American invention takes its way.

Sir Edward Watkin, Chairman of the Southeastern Railway Company, has informed a meeting of that company that two experimental shafts for the proposes Channel tunnel have been sunk on the English side and two on the French side, and that from one of the shafts on the English side a gallery 800 or 900 yards long and seven feet in diameter had been driven. The progress during the last week has been sixty-seven yards, which is equal to two miles yearly. They have thus solved the question of the rate of progress for the experimental gallery and ascertained that the lower strata is impermeable to water. The French experiments have realized exactly the same result. They had arrived, he said, at an understanding with the French tunnel committee that on each side of the tunnel a further heading of a mile should be driven. When these headings are finished, which certainly ought to be in six months, one-tenth of the question would have been dealt with, and a further treaty would then probably be proposed under which each party would accomplish the remaining nine miles on its side in view of meeting in the middle of the channel. A seven-foot gallery ought, on this system, to be completed in five years.

A Berlin dispatch says: The electrical railway between the Lichterfeld station and the Central Cadet Institution has proved such a success that it has been decided to extend it. The line is first to be continued to Steglow, and subsequently to Potsdam. At road crossings the conductors of the electric current are in future to be laid under the ground, so that horses may not be exposed to a shock. This precaution is absolutely necessary. The other day a cab-horse fell while crossing the steel rails when the current was in circulation, and another horse bolted from the same cause.

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

The Water Committee of the City Council, Gloucester, N. J., have issued the call for proposals for furnishing material and labor for constructing city waterworks. The plans and specifications call for a subsiding reservoir capable of holding 1,000,000 gallons of water, a water tower 18 ft. in diameter and 110 ft. high, to be supplied with water by means of two engines, each capable, at ordinary times, of pumping 500,000 gallons every twenty hours, and all the other buildings and apparatus essential to complete water-works. The supply of water is to be taken from Newton Creek, and the works are to be finished by the 15th of November next at an estimated cost of $60,000. Bonds to that amount are now offered by the city for purchase.

The proposals for the contract to furnish and lay the extension of the water pipe 1,000 ft. further into the lake, recently advertised for by the Board of Water Commissioners, says the Dunkirk (N. Y.) *Sunday Herald*, were opened at a meeting of the Board held on Saturday evening and decided upon at a further meeting held Monday evening. For furnishing the pipe there were two bids—Messrs. Sellew & Popple, and the National Tube Works Company, of McKeesport, Pa., the largest institution of the kind in the world. The latter proposed to use a lap-welded pipe, and the former a riveted pipe—in both instances 14 in. in diameter, and 900 ft. in length. As a consequence of this difference in pipe the bid of the National Tube Works Company was accepted at $3.90 per running foot. For laying the pipe there was but one bid, made by Walter S. Jarboe, engineer, of Pittsburgh, Pa., and Mr. W. P. Reynolds, of Dunkirk. They propose to lay the pipe according to specifications, some two feet below the bed of the lake, which will require sub-marine blasting for nearly the entire length, necessitating the use of divers. The price these gentlemen are to be paid is $7.50 per foot.

The Board of Public Works in the city of Providence, R. I., authorized Mr. George H. Corliss on the seventh day of the current month and year to build a complete pumping engine for the city water-works at Pettaconset, the engines now in use having failed to work satisfactorily, although their expense involved many hundreds of thousands of dollars. The engines hitherto at work are Cornish engines, while Mr. Corliss' plans, now adopted, are stated by him as follows: "I propose to locate such a station upon the bank of the Pawtuxet River, at an unoccupied point about two hundred feet below the present Cornish engine-house. Taking the ground as Nature formed it, I propose to assume the entire risk and expenses of constructing thereon permanent foundations and substantial plain brick buildings, apapted to all the practical requirements of a first-class pumping station; also a suitable chimney connected with boiler-house, and an ample pump-well connected by a conduit with the river-bed; also, the foundation for the boilers and pumping machinery; the whole arranged and adapted to receive a complete system of pumping machinery, which I propose to furnish, including engines, boilers and pumps, connected by steam and water pipes, and provided with every instrument and appliance, ready for continuous use, guaranteed to work safely and with ease while delivering nine million (9,000,000) gallons of water in twenty-four hours from the Pawtuxet River into a thirty (30) inch force main just outside of the engine-house wall, under sufficient pressure to carry it into Sockanosset reservoir, and while thus working to develop in every day continuous use a "duty" of one hundred million (100,000,000) foot-pounds—equivalent to raising 100,000,000 pounds of water one (1) foot high with one hundred (100) pounds of coal; and I will guarantee not only the proper working of all the machinery, but I will also guarantee the stability of its foundations, and will ask for no payment from the city for any of the expenditures to be made until the whole work is completed and tested, and a practical demonstration is made of its capacity and efficiency. It will be seen that this plan avoids all possible interference with the present means of water supply during the erection of the machinery, and removes all questions of divided responsibility for defects arising from imperfect foundations. Although the machinery is designed to pump nine million (9,000,000) gallons in twenty-four (24) hours, as above stated, I anticipate that it will deliver at the rate of twelve million (12,000,000) gallons in the same time without detriment to any of its parts. I will agree to furnish the buildings and machinery and their appurtenances, as above specified, for the sum of one hundred thousand ($100,000) dollars; and I will agree to complete the work in six (6) months from this date, provided the city promptly authorizes the acceptance of the above proposal." Mr. Corliss' early plans, submitted years ago, were rejected by the engineers who built the Providence water-works, otherwise remarkable for solidity, efficiency and public value. The people of Providence, their government, and their experts cannot deny that the Cornish experiment at Pettaconset has been a ruinous failure and greviously expensive, and that Mr. Corliss' plans were rejected, not because they were cheap, but because they were novel, and it was thought best to adhere to safe precedents. But the precedent was not safe, as the sequel proves. The Boston case is so far a close parallel. On account of safety the greater expense is risked, and good citizens will hope that the parallel may end there.—*Boston Advertiser.*

BRIDGES.

The Keystone Bridge Works, Pittsburgh, Pa., is running to its fullest capacity, and is pushed with orders.

J. R. Hastings, General Superintendent of the Peoria & Pekin Union Railway, advertises for bids for the construction of seventeen pile bridges on the P. & S. road between Peoria and Pekin.

Work on the new Albany and Greenbush bridge is progressing very rapidly. The pile drivers at work have finished driving piles for the north rest of the draw, and are about half through with those for the pivot pier. The caisson for the north rest is now being built on the other side of the river, and it is expected that it will be sunk the latter part of next week. On Monday or Tuesday the steam saw mill will begin cutting off the piles for the north rest. The pivot pier and the north and south rests will be hurried along, and it is thought that they will be finished inside of three months. As soon as they are completed the iron draw will be built on them. The bridge itself being very heavy it will take considerable longer to build the draw than the remainder. It is to be two stories, with carriage way on first story and cars above.

A dispatch from Pittsburgh, Pa., dated the 19th, states: "The people of Pittsburgh and Allegheny were treated to a rare spectacle to-day in the burning of the suspension bridge, one of the finest wire bridges in the country. Never in the history of Pittsburgh has such a curious fire been known, and never was there one so hard to extinguish. The bottom of the bridge was coated with coal tar and plank were embedded in it, and at a quarter of one the flames stretched almost from one end of the bridge to the other. There hung over the rapidly flowing river a belt of flames and smoke a fifth of a mile long and forty feet wide. All above the bridge was invisible from below it. The wind blew strongly and steadily up stream, and carried the smoke and fire with it and lent the fire a thousand fold additional fierceness. Of course so marvelous a sight drew thousands of people to the river, and until after five o'clock they lined the wharves and bridges from the broken arches of the Union Bridge up to Ninth street. Rarely have firemen had as difficult and as trying a task to perform. There was no way to reach the fire and hours passed before steamers from both cities could be transferred to the flats and taken into midstream where they succeeded in throwing a few streams on the flames. By diligent work of both fire departments the flames were finally got under control at six o'clock. The loss is $40,000. There was no insurance, because the structure was considered fire-proof. The bridge was built in 1859 for $800,000, the late John A. Roebling, of New York, being the architect. Between thirty and forty thousand people have crossed the bridge daily."

RAILROADS.

A dispatch from Belleville, Canada, of June 20, states: "Mr. George Anderson, of Tyendinega, has been awarded the contract for building the Bay of Quinte Railway from the G. T. R., near Marysville, to Deseronto. Work will be commenced to-day."

A Dallas (Tex.) dispatch says: "The Crosby road, from Sabine Pass northward fifty miles is already completed, and fifty-four more miles are graded. The remainder will be pushed through to Minneola as rapidly as money, men and energy can do the work."

Superintendent Miller, of the P., C. and St. L. has ordered several automatic gates put in at street crossings in Richmond, Ind. They will be opened and shut by the trains as they approach and recede. With them it will be impossible for a person to drive on the track in time of danger.

The Cincinnati, Indianapolis, St. Louis and Chicago company will soon commence straightening their road on the eastern division at a half dozen points where there are some sharp curves. Before taking a rest the management propose to get the road-bed in such excellent condition that the express trains can be run from Indianapolis to Cincinnati in two hours and fifteen minutes.

RIVERS AND HARBORS.

Captain James B. Eads is in Washington on his way to Toronto, where, at the request of the Canadian government, he will begin an examination of that harbor with a view to devising means for its permanent improvement.

The Legislature of New York has passed an act appropriating $30,000 for the purpose of removing obstructions and improving the navigation of the Hudson River between Troy and Coxsackie, by deepening and widening the channel, so as to secure, between the State dam and the railroad bridge at Troy, a channel sixty feet wide with a depth of five feet of water at low tide, and from thence to the lower railroad bridge at Albany, a channel one hundred and twenty-five feet wide with a depth of eight feet of water at low tide, and from thence to the town of Coxsackie, a channel one hundred and fifty feet wide with a depth of ten feet of water at low tide.

COUNCIL BLUFFS, Ia., June 22.—The interstate Convention for the Improvement of the Missouri River met here yesterday. Kansas, Nebraska, Missouri, Iowa and Dakota were represented. Addresses were made by ex-Governor Gear; Senator McDill, of Iowa; Senator Saunders, of Nebraska, and others. The resolutions reported recite that the wealth represented in the Missouri Valley is $800,000,000; that the valley produces annually 500,000,000 bushels of grain; that this rate is increasing 5 per cent. annually; that water transportation is the cheapest known to commerce, and the Missouri River was, prior to artificial obstruction, a great national highway, and can be so again by the removal of the obstruction; that the General Government has expended more than $200,000,000 already for river and harbor improvement of which but $670,000 in all have been expended on the Missouri River; wherefore, it is resolved, that the convention demand that Congress provide a thorough remedy for all artificial obstruction it has permitted to be created on the Missouri River by railroad bridges, etc., and also for a thorough removal of all obstructions, natural or artificial, and for a survey of the river with a view of deepening the channel, after which Congress will be requested to make such appropriation as will secure permanent and adequate improvements of the Missouri River, and that an appropriation of $5,000,000 for this purpose is just and proper.

NEW PROJECTS.

A dispatch from Galveston, Texas, dated June 22, says: "The Sabine & Western Railway Company filed their charter yesterday. The road is to extend from Sabine Pass to Houston, a distance of eighty miles. The stock is placed at $1,500,000."

The Pittsburgh, Cincinnati & St. Louis Company has just completed the survey of a road from Cincinnati to Richmond, Ind., that is shorter than the C. H. & D. road, and it is said that it will be in operation by the first day of July, 1882.

Papers have been forwarded to Columbus for the incorporation of the Defiance, Paulding & Van Wert Railroad. The capital stock is $200,000. The road will be standard gauge. The money needed to build and equip the road will be raised by subscription.

The contract for the building of the entire line of the Evansville, Dayton & Eastern Railroad from Lincoln City on the line of the Evansville, Rockport & Eastern Railroad to Dayton, O., has been let to the New Jersey & Western Construction Company, who will sublet certain portions of the road.

TOPEKA, June 18.—The latest important railroad enterprise is the incorporation of the Nebraska, Topeka, Iowa & Memphis road, papers for which have just been filed. The road is to run from this point south to Girard, Kansas; thence south through Missouri and Arkansas to Memphis. It will also run from this point north to Lincoln, Neb. Eastern capitalists have agreed to take bonds and assume the construction, aid for which will be voted by townships through which the road passes. All preparations are being made for the preliminary survey. The route will traverse a country having no railroad facilities at present, tapping rich coal mines in Southern Kansas and Missouri.

MONTREAL, June 15.—The engineers in charge of the surveys and location of the South Shore Railway from Dundee and Huntington, in this Province, have completed their work, and are preparing plans preparatory to the enterprise being put under contract. This road will connect at Dundee with the projected Potsdam & Montreal Railway, thereby forming a through route at Potsdam Junction, over the Rome, Watertown & Ogdensburgh Railway, to the Suspension Bridge, connecting at that point with the Great Western Railway, thus giving Montreal another outlet to Chicago and the Western States. The surveys just completed show that the road can be laid at a moderate cost—about $20,000 a mile—the country being for the most part level and involving no deep cuttings.